As It Seems To Us

REINDEER IN ALASKA

REINDEER—not those reputed to be in the service of Santa Claus—first transplanted to Alaska 39 years ago, have made amazingly rich returns upon the expenditures incidental to their introduction and to the care needful in fostering the developing herds. The facts of that work have some of the qualities of fiction because of the results that have followed a venture upon which a great many people smiled skeptically.

The men directly responsible for the importation of the original sixteen reindeer from Siberia contributed to that effort in the hope that the well-nigh desperate economic situation of the native population of Indians and Eskimos could thus ultimately be changed materially for the better, provided the reindeer found Alaska a suitable environment and reproduced their kind. Between 1891 and 1902, a total of 1,280 head of reindeer was imported by the Government—the aggregate outlay for the work up to 1903 amounting to $158,000. Today, according to competent persons, the herds of the Territory number between 900,000 and 1,000,000 animals, and the value per head averages in the neighborhood of $25!

But it is not alone in the monetary significance of the outcome that the value of the undertaking lies. The multiplication of the reindeer—two-thirds of which are owned by natives—has brought in its train social and economic betterments that have radically altered the erstwhile habits of life of the aborigines. Instead of a nomadic people living precariously upon wild life hunted far and wide, the possession of reindeer has given the Indians and the Eskimos a communal permanency that has led to the establishment of settlements where they can live and develop in ways characteristic of civilization. The reindeer provide not only a source of revenue but they furnish food and material for climatically appropriate clothing. The transformation that has been wrought through the introduction of reindeer in Alaska is nothing short of astonishing. The benefited natives have been raised to a plane that has given them capabilities they had not manifested 40 years ago, and they will, undoubtedly, play a prime part in the future exploitation of Alaska.

It is interesting and significant to point to what the Dominion of Canada is now doing in the same direction, and in an effort to utilize her own very expansive barrens. The Dominion has purchased 3,000 Alaskan reindeer; and the animals are now on the long trek to the new grazing grounds in the neighborhood of the Mackenzie River delta. Canada counts upon achieving through the reindeer just what we have been able to do in Alaska. We wish her every success, because one and all of us will be the gainers in time.

EMPIRE STATE EXPRESS

IN this age of rapid changes and continually altered records, one can readily understand the pride with which the New York Central Railroad points to the 39 years of completed service of one of its crack trains, the Empire State Express. That flyer made its initial run between New York City and Buffalo in 1891; and the train, for that run, was made up of two day coaches, a sleeper, the private car of a vice-president of the road, a combination baggage-buffet car, and the locomotive. The departure of the train attracted a large crowd of well-wishers. Two years later, on one of its runs, the Empire State Express attained for a distance of one mile the notable speed of 112.5 miles an hour!

The original Empire State Express represented a dead weight of 278 tons. Today, the train that bears the same title is composed of sixteen cars and, with its powerful Hudson type locomotive, weighs substantially 1,530 tons. This fine express covers the distance of 438 miles between New York City and Buffalo at the best recorded speed for the distance; and in the course of a year it transports more than 300,000 passengers. Someone, with a fondness for figures, has computed the miles run in the course of the past 39 years, and they aggregate 10,748,000 miles. In other words, the Empire State Express in the course of its nearly four decades of continuous performance has traveled a total mileage equal to 45 times the mean distance between the earth and the moon. Quite apart from what this typifies in the way of a splendidly sustained public convenience, it brings to the attention of the casual public something of the tremendous part played in our daily life by the nation's outstanding trunk lines.

By way of illustrating the volume of traffic carried by some of these special trains, we may mention that one of the "limiteds" on the same line is no longer a single unit but is dispatched in nine separate sections within a span of a few minutes.

SALAD DRESSINGS

WHILE some of our communities have lately been pridefully engaged in celebrating their tercentenaries, we have evidence in other directions that we are still in the full fling of our "salad days" of youthfulness.

During the last week of October, the Mayonnaise Products Manufacturers Association foregathered at Atlantic City to hold its fifth annual convention. An official of the foodstuffs division of the United States Department of Commerce made a heartening address to the assembly. From sources of governmental information, he revealed that mayonnaise products turned out in the United States during 1929 had reached the astonishing value of $32,965,563—representing an increase of $3,750,000 above the production of the preceding year.

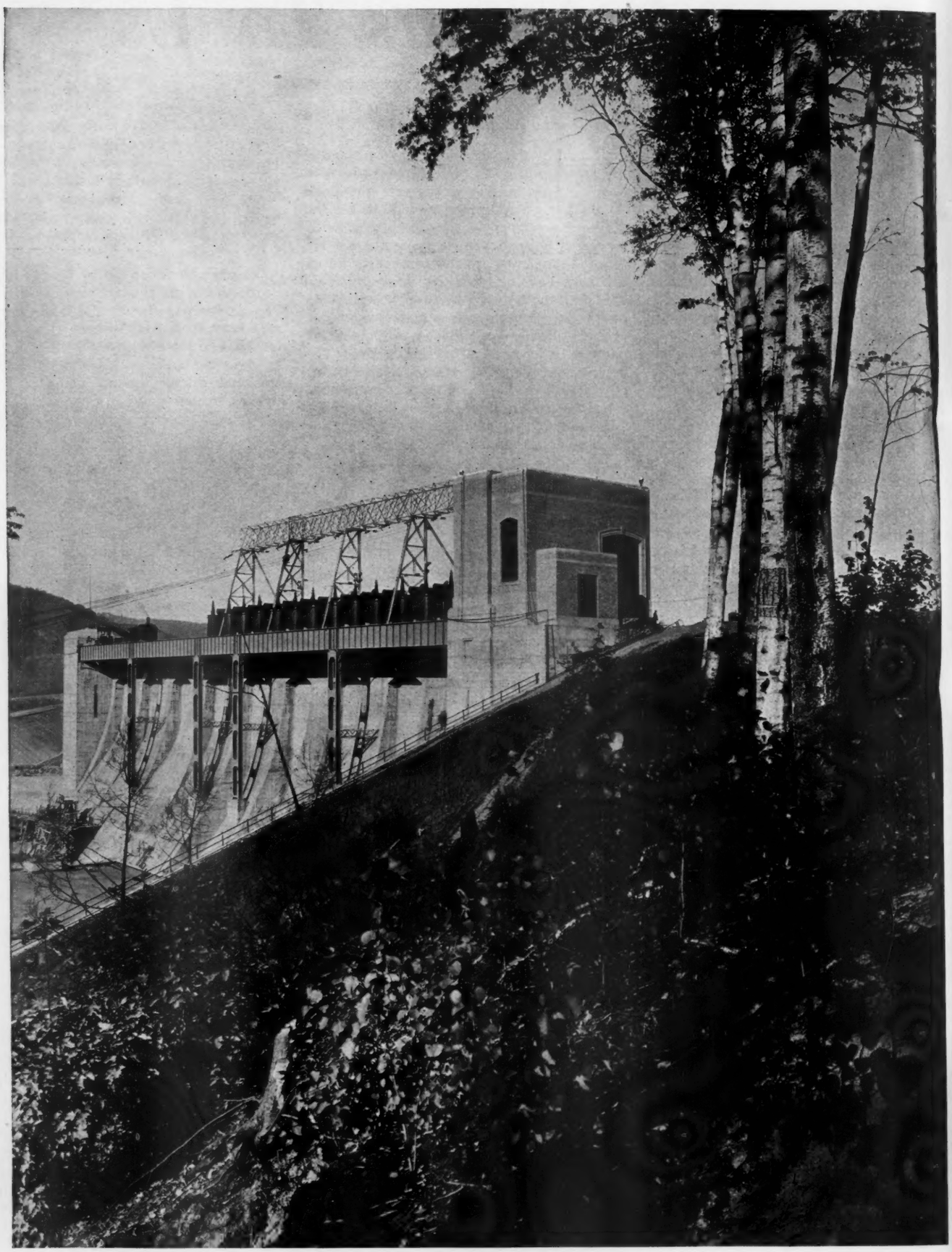
There is a considerable number of us that can recall the days when virtually all salad dressings were made in the home, and no one dreamt then that they offered possibilities for "big business". Has the growing habit of buying ready-made dressings any sociological significance? We are not going to try to answer our own question.

DIAGNOSTICIANS

THAT hard-pressed person, "the average citizen", must be sorely puzzled if bent upon learning why there is unemployment and prevalent business depression. Quite naturally, he turns to daily papers for enlightenment; and his bewilderment is apt to be made greater if he accept at their face value the opinions of reputed experts as summed up in current headlines.

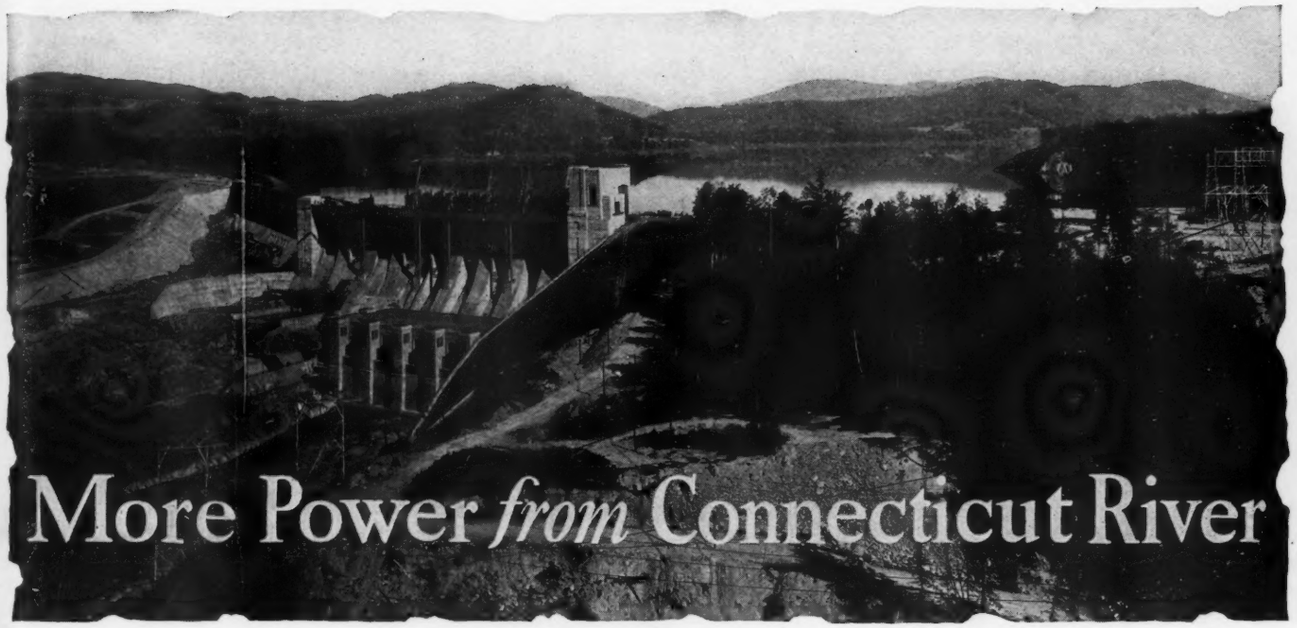
From some we learn that the gold standard is at the bottom of the world crisis, while by others we are assured that there would be absolutely no economic stability but for the gold standard. According to certain of these prophets, American luxury is at the bottom of our own predicament, while the economist of a widely known publishing concern is said to urge high living in order to restore trade. "Buy Now", is the slogan of a multiplying group seeking to promote business; while we know that careful spot buying is the present practice of some of our largest industrial enterprises. One genial gentleman declares that science will cure unemployment and thus do away with all idleness.

Possibly, there is a modicum of merit and even wisdom in these seemingly conflicting views—the problem lies in reconciling them and in reducing them to a single procedure that will be generally beneficial. The situation is not unlike that which many of us have experienced when being passed from one to another of a numerous group of medical specialists. We recall that a diagnostic clinic was instituted in a certain metropolis not so long ago to save sufferers from the outlays and the discouragements born of dealing with a succession of specialists. Perhaps some genius in the business or economic world will devise ways to create a similar clinic for industrial ills. The experts will always find plenty to keep them engaged.



A Monument to Splendidly Coördinated Efforts

Towering central section of the great dam at the foot of Fifteen Mile Falls in the Connecticut River



More Power *from* Connecticut River

Fifteen Mile Falls Lower Development Completed on Schedule and Now Generating Large Block of Electric Energy

By R. C. SKERRETT

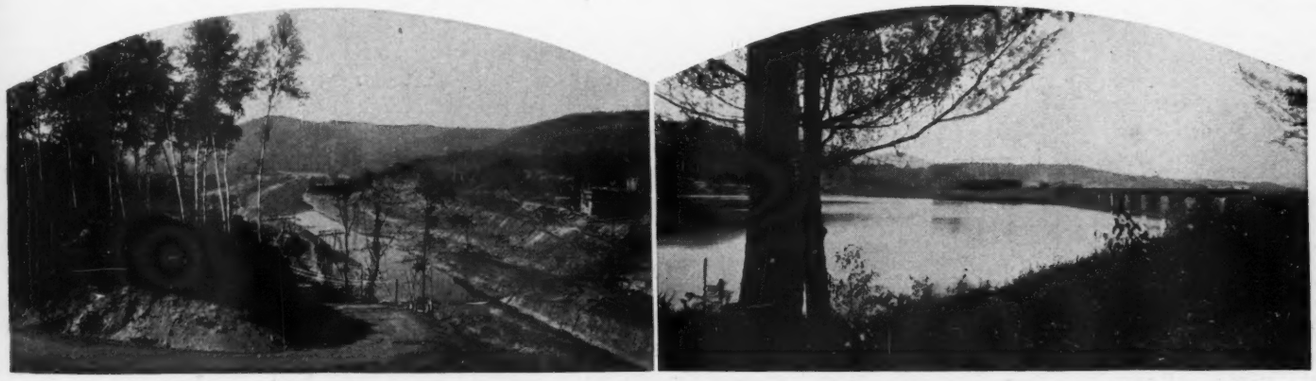
HOW two "terrific jinn" built a palace overnight for Aladdin's princess in Cathay is a time-honored story of the Orient. How the New England Power Association reared in the course of only 25 months a monstrous power plant at the foot of Fifteen Mile Falls on the Connecticut River is a tale of modern engineering wonders—achieved not by magic but by skill, the speed, and the unsparing efforts of a veritable army of carefully coördinated workers. The present-day fact is far more amazing than the colorful fiction of the past.

Many thousands of tourists visited the scene of operations while the towering dam and its capacious power house were in course of construction. Henceforth thousands of other sightseers will journey there and marvel. But how many have appreciated and how many will grasp the magnitude of the task that had to be performed before the riotous waters of that stretch of the Connecticut River could be brought under control and its latent energy converted into electric current to be dispatched near and far to perform manifold and essential services in the home, in the factory, and on the farm?

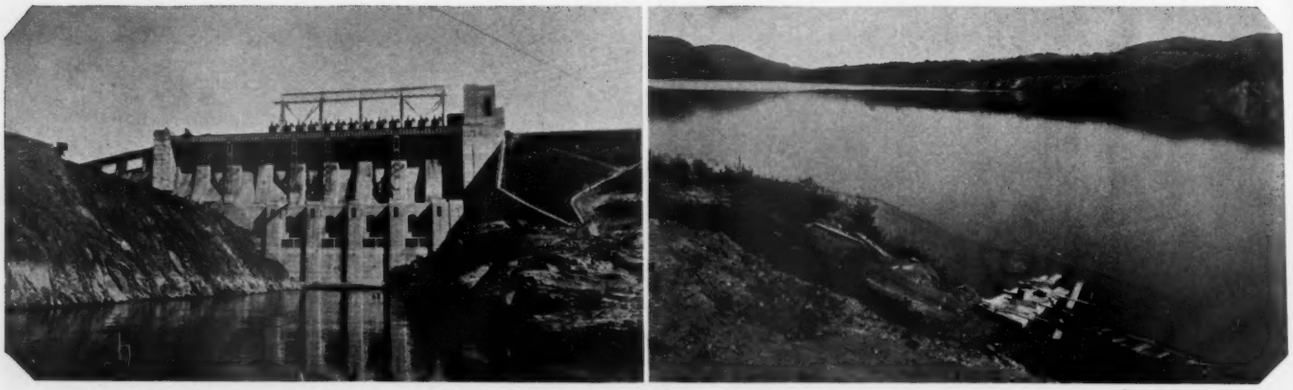
Prior to August of 1928, the Connecticut River followed its unchecked course seaward as it tumbled over the rocky bed forming Fifteen Mile Falls—dropping the while 320 feet within that comparatively short distance. Years back, when the hills flanking the headwaters of the Connecticut were covered with fine stands of timber, lumbermen used the stream to float their logs to mills and to markets. Even so, the falls constituted an ever-present hazard by occasioning frequent jams that brought disaster, that took a toll of life, and that led often to open conflict over the right of way. In time, lumbermen ceased to make use of that part of the river for their drives.

For a goodly while, hydraulic engineers pictured how power could be garnered from those troubled, foam-flecked waters by the interposition of one or more dams strategically placed to impound the flow and to utilize the total head of the stream drop to actuate great water wheels hooked up with appropriately large electric generators. A survey of the region was made in 1906, but a final examination of the section was not made until 1926; and out of that revealing work emerged the ambitious plan of the New England Power Association—a plan that calls ultimately for two dams within the span of Fifteen Mile Falls. It is with the first of these dams—the one at the foot of the falls, and now finished, that this article deals.

The Fifteen Mile Falls Lower Development, with its associate works, represents an outlay aggregating more than $30,000,000, and it also typifies one splendid forward step in the rehabilitation of New England's erstwhile industrial supremacy. But in order that that vast sum of money should be well and carefully spent, it was necessary that the engineering and the fiscal authorities of the



Left—Looking downstream from the dam toward tailrace where river channel was corrected for a distance of 6,400 feet. Right—Lake above dam viewed from Vermont shore. This lake is capable of impounding 18,000,000,000 gallons of water.



Left—Tailrace formed in the river bed by excavating 120,000 cubic yards of rock. Power house seen at foot of dam. Right—Lake which now extends upstream for a distance of substantially eight miles.

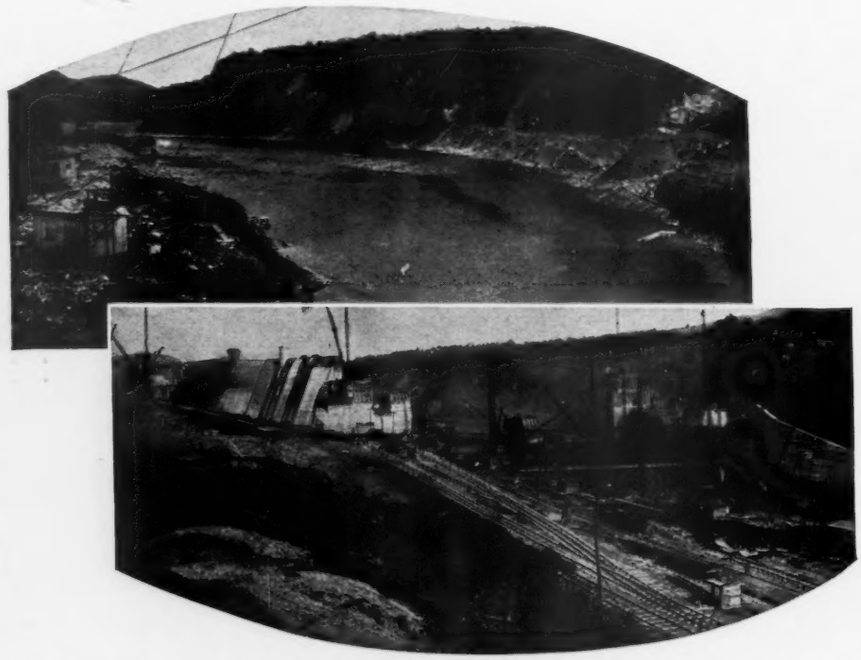
New England Power Association should be thoroughly convinced that it was both practicable and wise to rear the great dam and power house that now constitute a monument to exceptionally fine teamwork.

Geologically, Fifteen Mile Falls and the flanking banks of the Connecticut River were something of a puzzle. On the west or Vermont side, shoulders of granitic rock heaved themselves high above the surface of the stream, while on the New Hampshire side of the stream there were more or less pronounced bluffs or slopes of virtually solid earth. The Vermont shore offered an admirable anchorage for the western section of the projected dam, but such could not be said of the formation at the New Hampshire end of the structure. The problem was to ascertain where rock could be found on that bank of the Connecticut. Two eminent geological experts made the needful survey and discovered that, with certain alterations in the plans, it would be entirely feasible and safe to rear at the foot of the falls a massive dam rising to a maximum height of 178 feet above the rocky bed of the river. Electrical prospecting, previously resorted to only in exploring for minerals and for petroleum, served to supplement the drill holes and test pits in developing the geology, and proved a very useful method of determining rock contours.

Incidentally, it was discovered that the nearly horizontal and low-lying rock beneath the river on the New Hampshire side was part of a prehistoric sunken valley upon which glaciers had shoved or deposited deep masses of earth and gravel. The Connecticut River, during the lapse of thousands of years, then carved its present course. While those ancient glaciers added somewhat to the difficulties of the engineers, still they changed the primordial flow of the river so that a highly desirable power site should be available for modern man to utilize.

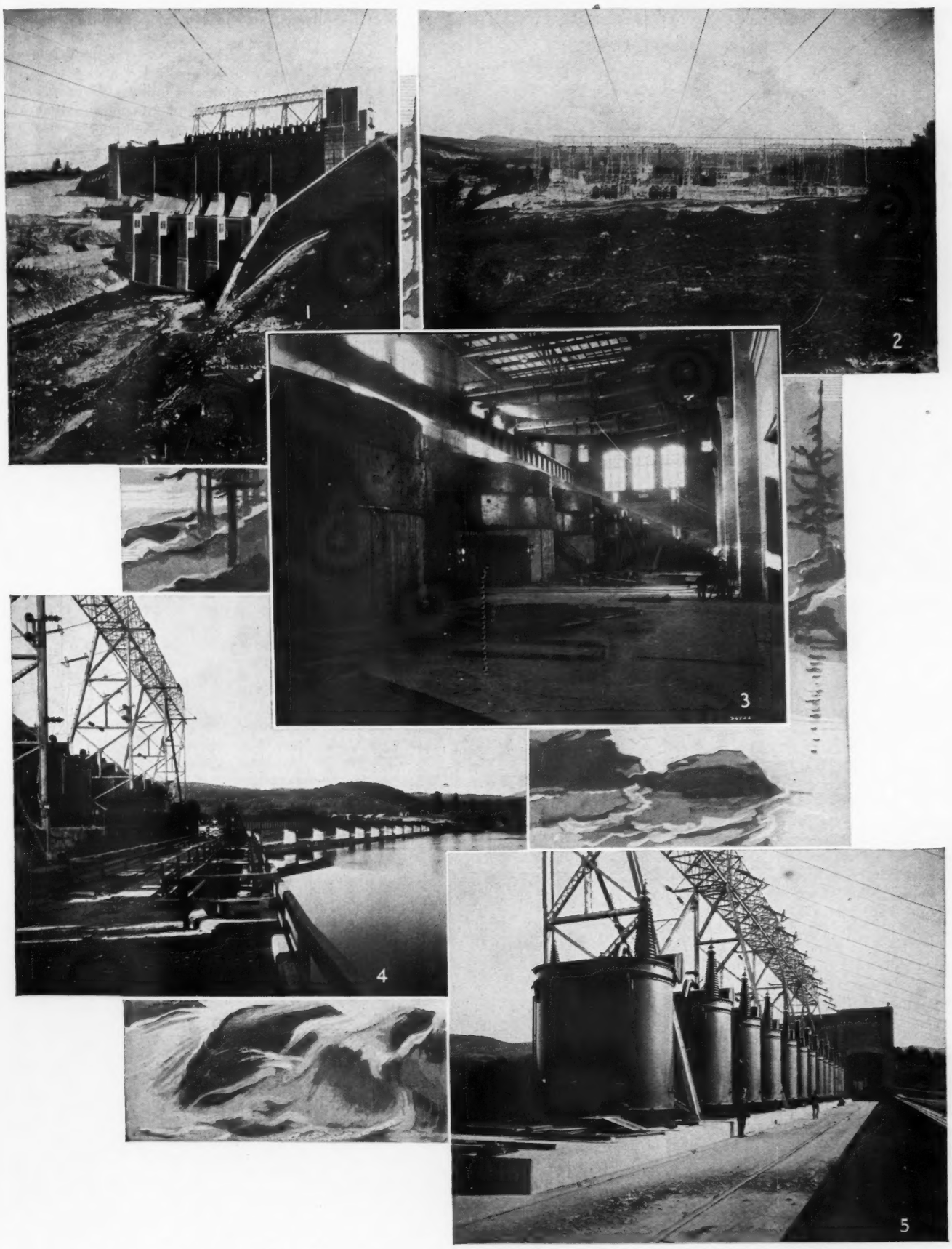
Not only was it essential that the fitness of the power site should be established beyond question, but it was equally important that the whole area that was to form the bowl for the impounded water should be capable of holding the water without fear of serious or menacing seepage. This entailed a very exhaustive survey. The soundness of the rock immediately beneath the dam was determined by numerous diamond-drill holes. After excavating all loose or weathered rock, and before placing concrete, the soundness of the rock was further examined by holes drilled under the upstream third of the dam. These holes, 20 feet deep and spaced on 20-foot centers, were sunk with X-71 drills, and grout was then forced into them under an air pressure of 80 pounds. By filling these holes to the point of refusal it was possible to establish indisputably the soundness of the rock. So much for some of the preliminaries that made security doubly sure. We might also mention that the geological survey revealed conveniently near the dam site rock of a superior sort to be used in concrete and also an ample deposit of sand for the same purpose.

Having decided in 1928 to develop the power possibilities of Fifteen Mile Falls, and having concluded to start that work by constructing a dam and a power house at the lower end of the falls, the engineering experts counted upon the whole of the open months of that year to do much necessary preliminary work and to have their operating forces in full swing before winter arrived with its hampering snow and ice and low temperatures. That particular section of the Connecticut Valley has about five months of winter during which the thermometer registers most of the time around zero. Even so, substantially four months of the open period were passed before the great job was started. To be exact, work began on August 20, and consisted of the building of a branch railroad three miles long linking the undertaking with the main line of the Canadian Pacific Railway at Inwood, Vt. A few days later the rearing of a commodious camp was taken in hand that would provide comfortable quarters for 1,700 men during the peak of operations. All told, at the height of activities, there were 2,700 men engaged on or about the dam.

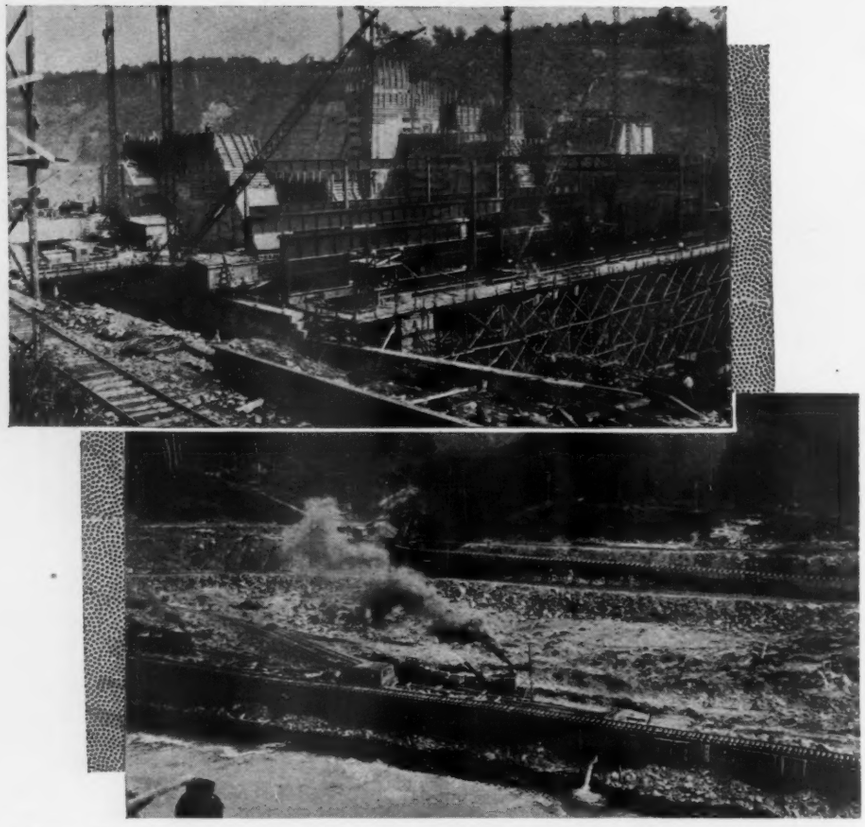


Top—Connecticut River just above dam site as it appeared in September of 1929. Bottom—Status of construction work on Fifteen Mile Falls Lower Development when photographed at the foregoing date.

It is not our purpose to delve into the technicalities of this undertaking. We want, instead, to leave with the reader an appreciative understanding of the general extent of the work involved and to let him realize how one and all of the leading officials and their loyal subordinates worked unceasingly and frequently amid hardships so as to make certain that every contributive operation should go forward with-



1—Non-overflow section of the dam. Power house at foot of the structure contains four 50,000-hp. hydro-electric units. 2—Switch yard, high on New Hampshire side of the river, that dispatches current to Tewksbury, Mass., 126 miles distant. 3—Generator room containing four Westinghouse 50,000-hp. generators actuated by four S. Morgan Smith turbines. 4—Upstream picture of dam showing spillway section 850 feet long. 5—These General Electric transformers, the largest in New England, step up current generated at 13,800 volts to a potential of 220,000 volts.



Top—Non-overflow section of the dam as it appeared in September of 1929. Some of the 5,000 tons of structural steel used are shown in place. Bottom—Photograph, taken at the same time, of the diverted river and the cofferdam that permitted the unwatering of the enclosed area so tailrace could be excavated.

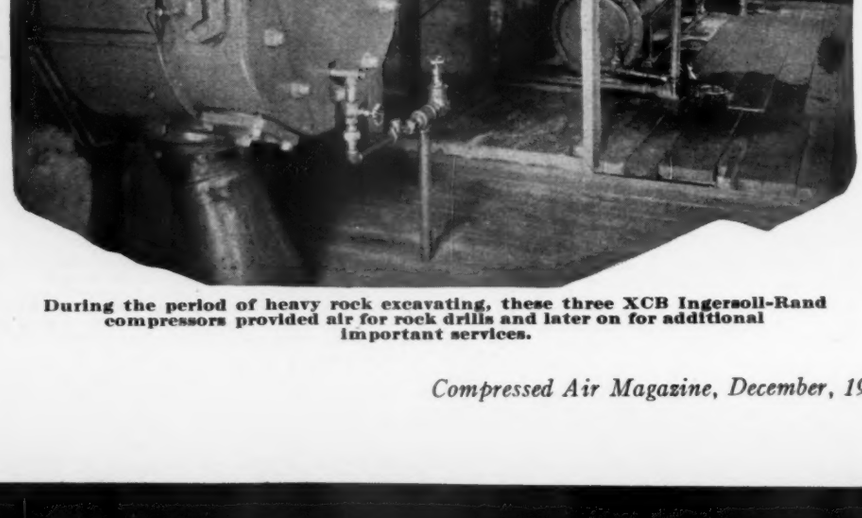
out serious setback and be ready to function as designed on the day fixed for the climax of their united labors. Today, the visitor sees a towering structure that measures from end to end substantially 2,000 feet. This is made up of a spillway section 850 feet long over which the river may seek an added avenue of escape during flood-water periods; then there is the still more imposing central or non-overflow section of the dam, against the downstream foot of which nestles the power house within which are installed four 50,000-hp. hydro-electric generators; and beyond, on the New Hampshire side, is the unusually large and high concrete retaining wall that performs the double function of anchoring the dam to the underlying rock on that bank of the stream while forming a monster tie for the immense earthen dike that merges into the hillside and constitutes the easternmost section of the dam. That dike contains 320,000 cubic yards of earth that had to be moved into place and packed hard by steam rollers to make sure that it would be impervious to the water impounded by it.

Before any part of the dam structure could be built, it was necessary to turn the river aside by erecting a cofferdam that would serve to lead the stream from its accustomed course and into a new channel carved out of the bed of the Connecticut on the Vermont side of that waterway. This entailed the excavating of 60,000 cubic yards of rock. Much of that work had to be done in the depth of winter when bitter cold and suddenly rising waters—due to ice dams—added both to the severity and to the dangers of the work. Nevertheless, the men engaged toiled on whenever it was physically possible for them to do so.

With the river led into that temporary channel, then another cofferdam was constructed below the dam site so as to enclose an area 600 feet long and several hundred feet wide, from which the water was pumped to bare the river bed. This permitted the excavating of the tailrace, through which the water discharged from the draft tubes below the turbines is directed back into the river. At the dam, this tailrace is 40 feet wide and 40 feet deep—thus increasing the effective head operating upon the big water wheels. The bottom of this tailrace gradually ascends until the water is 25 feet deep and the channel has broadened to 110 feet where it merges with the straightened and somewhat modified former course of the Connecticut. The tailrace required the excavating of about 120,000 cubic yards of rock; and some of our pictures show the rock drills doing the work. The improvement of the river channel necessitated the excavating of 600,000 cubic yards of sand and gravel.

When the river bed beneath the area to be occupied by the dam was unwatered, the very irregular rock surfaces were found to afford an excellent anchorage for the dam—thus obviating the need of a cut-off trench to lock the concrete with the supporting rock. The builders had only to wash and to clean these surfaces to make them ready for the pouring of concrete. As section after section and lift after lift was poured, great care was exercised to insure an intimate bond between succeeding lifts. The uppermost surface of the last lift poured, when sufficiently set, was picked over to uncover any loose stone in the concrete and blown clean with jets of compressed air before concrete for the next lift was poured upon it. All told, 360,000 cubic yards of concrete were poured in forming the different sections of the dam and certain associate features.

Because of the great quantity of concrete placed and the importance of the part played by it, the character of the rock, the sand, and the cement composing it was scrutinized continually. The concrete had to have a crushing strength of 2,000 pounds per square inch after seasoning for 28 days. The people that fur-

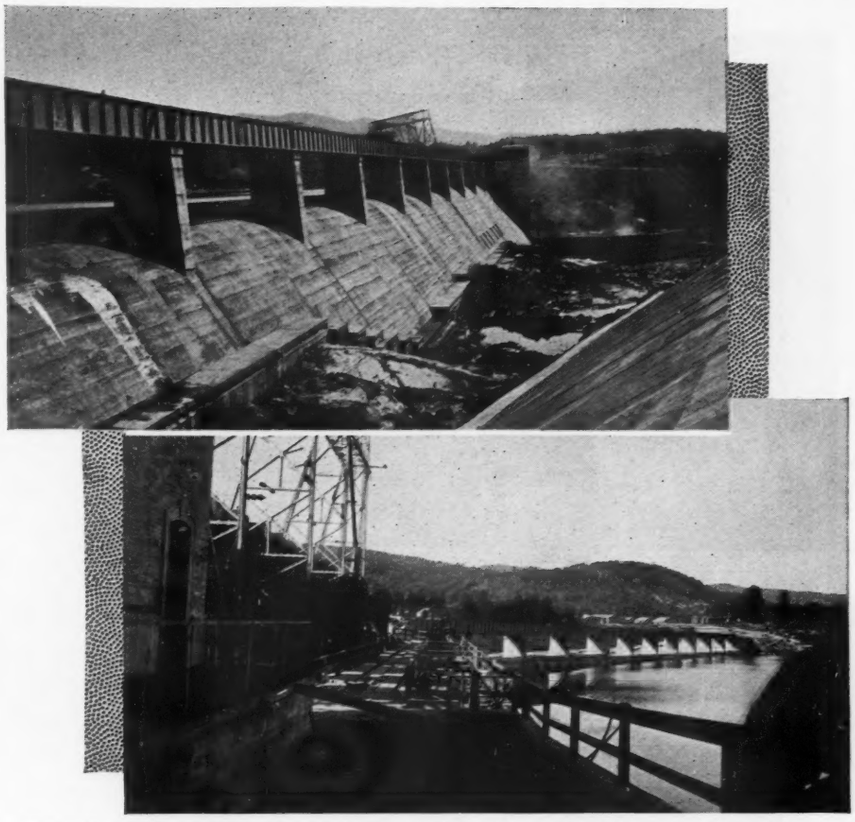


During the period of heavy rock excavating, these three XCB Ingersoll-Rand compressors provided air for rock drills and later on for additional important services.

nished the cement were obliged to live up to that exacting standard. Every pound of the ingredients entering into the concrete was measured before going into the four large mixers on the job; and every cubic yard had to be mixed for a period of 1½ minutes—the time being measured by a sand glass. Test cylinders of cement were placed in a special chamber—kept suitably moist—for seasoning, and then subjected to test in a hydraulic press. In spite of the rigorousness of the supervisory routine, the concrete-mixing plant was able to meet every demand; and it is interesting to recall that approximately 2,000 cubic yards of concrete were placed in the course of 24 hours, day in and day out, over a protracted period.

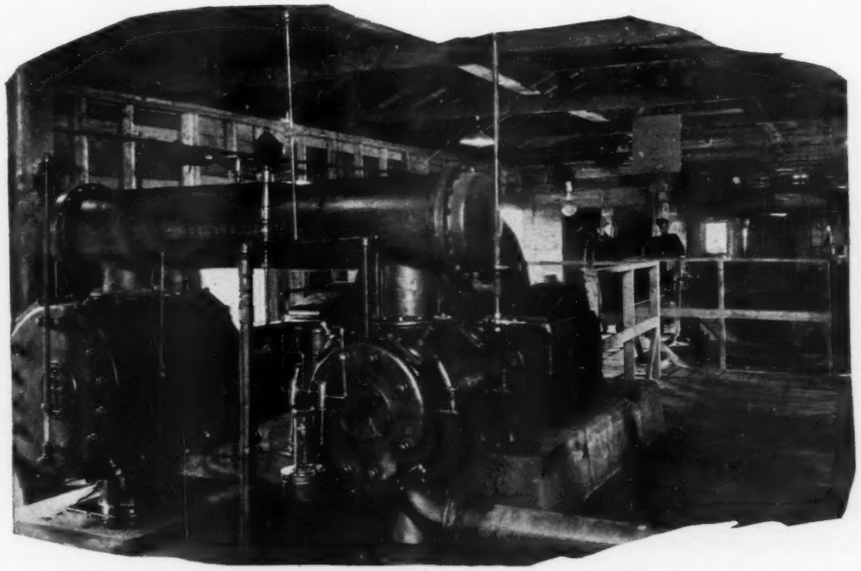
While the operating force at the dam toiled amid the confusion of shrieking locomotives, clattering steam shovels, the rumbling of muck trains and various other mechanical aids, high on a nearby Vermont hillside an unseen organization worked swiftly and silently to make sure that supplies of all sorts should flow from near and far to Inwood and thence to the storerooms, the shops, and the points about the job where they were needed. One of the secrets of the completion of the job on schedule hinged upon the work of this office group. Materials and supplies had to come on time, and yet not in such haste as to glut storehouses or to impede work immediately in hand.

When the dam was well along, glistening steelwork began to rise upon a high plateau below the dam, on the New Hampshire side of the river. That was the beginning of the great switch yard that takes the current from the transformers on the crest of the dam and sends that current on its way to the great substation at Tewksbury, Mass., 126 miles distant. And between that switch yard and Tewksbury, a considerable organization toiled for months to rear innumerable transmission towers and to string the cables that transport the energy to the points desired. Urged on by their own desire to make a record and to have their particular work completed by October 1, these men labored early and late under all conditions of weather, with the result that they had their part of the system tested and fit for service when the generators began producing "juice".



Top—Downstream face of the spillway and the associate spillway channel that will carry away surplus water during flood periods. Bottom—Looking from the non-overflow section of the great dam toward the Vermont shore.

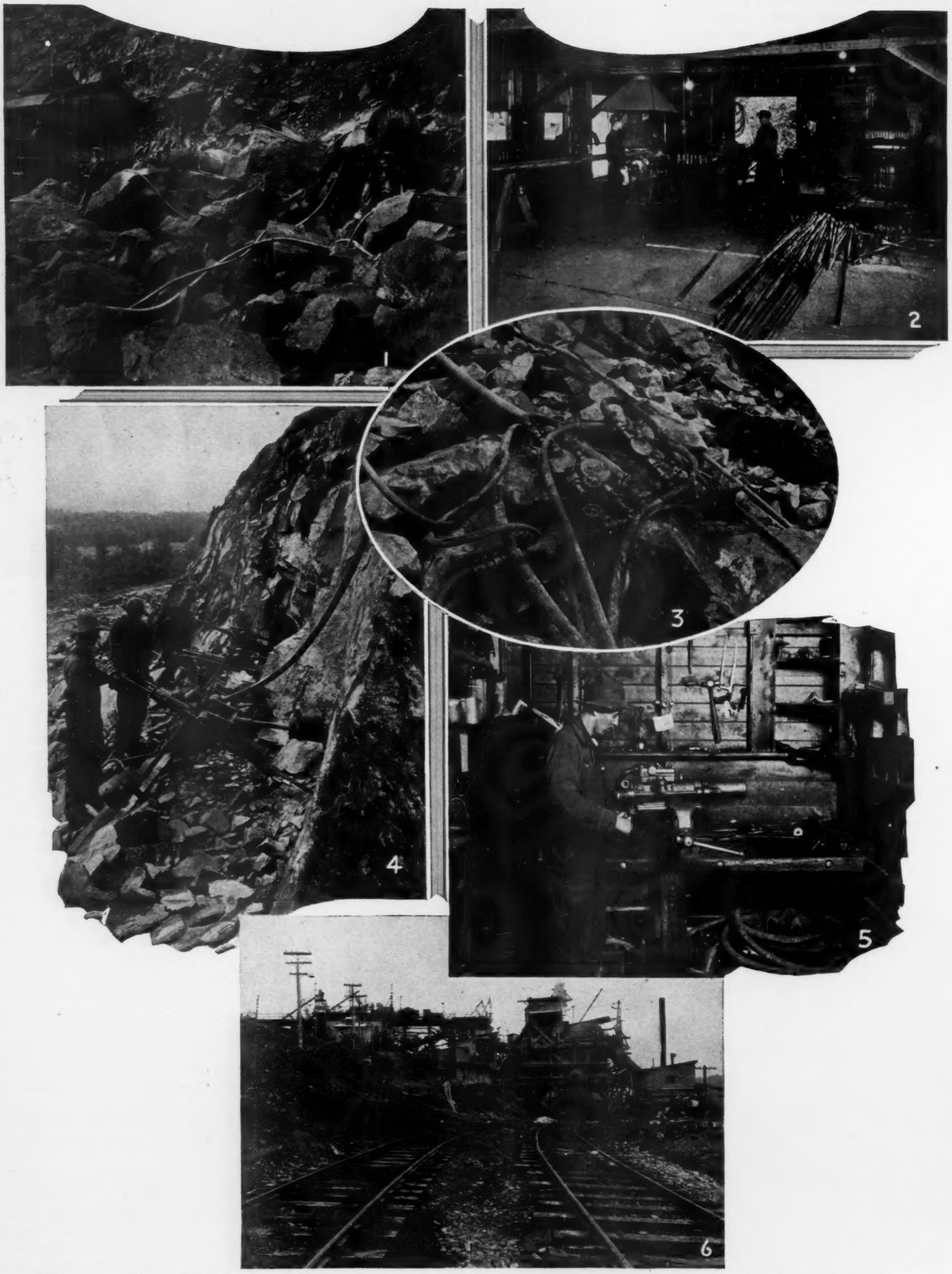
The Fifteen Mile Falls Lower Development is the greatest hydro-electric plant that has so far been constructed in the New England States; and its aluminum cables are the first to distribute current in those states at a pressure of 220,000 volts. Each cable is composed of as many as 61 strands, of which 54 are of aluminum and surround a core made up of the seven remaining strands, which are of galvanized steel. All told, there are in the system a total of 760 miles of these aluminum cables which, together with the ground wire, gives an aggregate length of cable of 1,280 miles! Just what this means can perhaps be more clearly understood if it be known that these strands, if united end to end, would produce a single wire long enough to reach twice around the earth at the equator.



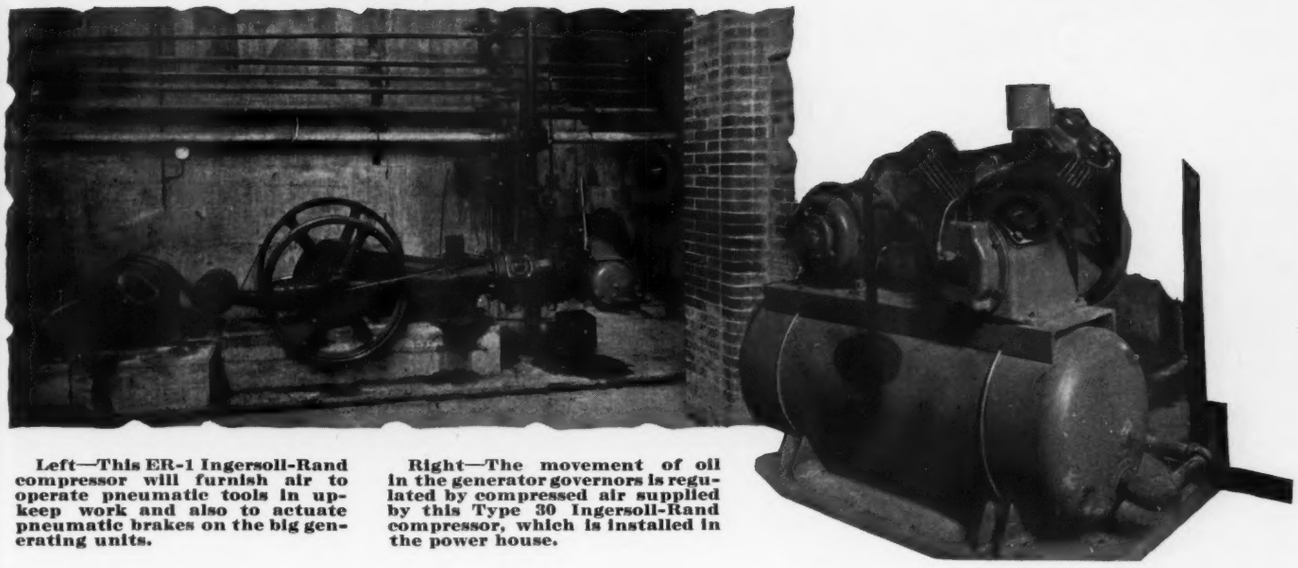
Two large PRB-2 Canadian Ingersoll-Rand compressors were the source of operating air for the blacksmith shop and the rock drills in the large quarry associated with the Fifteen Mile Falls Lower Development.

Recalling the noise and the well-ordered bustle at the dam site a year or so ago, one is startled by the comparative silence that now prevails there; and this feeling is intensified as one stands in the calm of the control room of the power house where different-colored signal disks glow and tell to the informed eye just how the current generated is going forward and what is the operating status of the system. That switchboard is the symbol of the climax aimed at when work on the project was started in August of 1928—a little more than two years ago. Surely, a very remarkable accomplishment.

Looking at the present magnificent hydro-electric plant at the foot of Fifteen Mile Falls, one's thoughts instinctively turn back to those days when a multitude of simple water wheels in the New England States converted the pent-up force of descending streams into power that could be applied directly to the driving of machinery of one sort or an-



Activities in latter part of 1929. 1—Block-holing hard rock in quarry. 2—Well-equipped blacksmith shop near quarry. 3—Ingersoll-Rand air-line lubricators in quarry. 4—Drilling toe holes or lifters in quarry with X-71 drills. 5—In the drill doctor's shop. 6—Stone-crushing plant, adjacent to quarry, that furnished the stone used in preparing 360,000 cubic yards of concrete.



Left—This ER-1 Ingersoll-Rand compressor will furnish air to operate pneumatic tools in upkeep work and also to actuate pneumatic brakes on the big generating units.

Right—The movement of oil in the generator governors is regulated by compressed air supplied by this Type 30 Ingersoll-Rand compressor, which is installed in the power house.

other. The present-day water-power plant, on the other hand, furnishes energy in a form that can be dispatched to near and far-away points over a network of wires and thus obviates the more or less costly transportation of fuels. By reason of these facts it is unnecessary to emphasize here how heavy has been the handicap under which the industries in the region in question have labored since the use of steam generally supplanted the God-given water power of earlier days.

With this background by way of contrast, it is possible more accurately to evaluate the tremendous significance of the service that will be rendered by the Fifteen Mile Falls Lower Development. No wonder the men that promoted it and made it are proud of that undertaking.

The gigantic task represented by the Fifteen Mile Falls Lower Development was carried through primarily by the designing engineers of the New England Power Construction Company, the Connecticut River Development Company, and the Fraser-Brace Engineering Company, Inc. The two latter organizations did the construction work.

FLASH LAMP TO REPLACE FLASH POWDER

COMMERCIAL photographers that specialize in the taking of indoor pictures, as well as amateurs, should welcome the new flash lamp that has been developed for them and that can be screwed in any standard electric-light socket. It is the product of the General Electric Company, and would seem to be a great improvement over the powder that has served the purpose so long. Unlike powder, its use is not attended by noise, odor, smoke, and the danger of fire.

The flash is in the form of a clear-glass standard bulb filled with oxygen and containing a filament coated with a special preparation and surrounded by a quantity of crumpled sheets of very thin aluminum foil. The lamp has a voltage range from 1.5 to 125, and can be operated on any 115-volt circuit or with dry, storage, or flashlight batteries. When the circuit is closed the filament is lighted and this, in turn, ignites the foil, which gives the brilliant light necessary for picture-taking. Obviously, a new lamp is needed for each flash.

AIR-DUMP CAR FOR USE ON NARROW-GAGE TRACK

BECAUSE their air-dump car of the drop-door type for standard-gage track has been so well received in its designed field of operations, the Western Wheeled Scraper Company, of Aurora, Ill., has turned out a new model that is similar in all respects to the earlier one except in the matter of gage, which is of 36 inches. It is intended for all kinds of stripping and mining work where local conditions are such as to make the use of narrow-gage equipment desirable if not necessary.

The new car is of low loading height and has a capacity of 10 cubic yards. Its dumping is effected quickly with compressed air by means of single-stroke cylinders, one on each side of the bed. The consumption of air for this purpose is said to be relatively low. The bed cannot be tilted until air has been admitted to the cylinders, thus effectually preventing any accidental discharge of the load which is dumped well beyond the rails—the car's down-turning door serving as a chute.

Left — Block - holing large pieces of rock in the unwatered area during the excavating of the tailrace which carries away the discharged water from the great turbines.

Right—A battery of S-49 "Jackhamers" drilling toe holes preparatory to blasting the ledge lying in the unwatered tailrace area.

Dropping a Dam into Place to Divert a River

DAMS are usually built in place, from the bottom up, but here we have an instance of a dam that was built end on and then dropped into position, as *Research Narratives* tells us in the following interesting article.

Inventions do not always lead to patents and quantity production. Many inventions are engineers' applications of scientific knowledge and of experience to individual problems. Achievement of a large enterprise is sometimes staked on an operation for which there can be no preliminary trials. Here is a story of such an adventure and its thrilling success.

The Alcoa Power Company, Ltd., a subsidiary of the Aluminum Company of America, has under construction a large hydro-electric power development at Chute-a-Caron on the Saguenay River about 140 miles north of the City of Quebec. The Saguenay River has a flow varying from 35,000 to 225,000 cubic feet per second. The site selected for the Chute-a-Caron power plant is naturally in a gorge, located in a rocky section of the river. In order to complete the large masonry dam across this gorge it was necessary to excavate a diverting canal and to turn the river at a time of low flow through this new channel while masonry foundations were being extended across the original channel, which is the deepest part of the gorge.

The usual method of putting in timber cribs and weighting them down with stones, or large blocks of any heavy substance, was not quite practical due to the extreme depth and high velocity of this water. James W. Rickey, hydraulic engineer of the Aluminum Company of America, suggested that a large, heavy, reinforced-concrete tower or "obelisk," of the proper length and curved on one side so as to fit as nearly as possible the bottom of the river, be built on a concrete pier at the edge of the river at a convenient place upstream from the power dam; and then, by blasting away a small portion of the pier, that the obelisk be tipped over into the river so that it would become a dam. This scheme was worked out very carefully by Mr. Rickey's staff, his consulting engineering staff and his construction engineers on the ground.

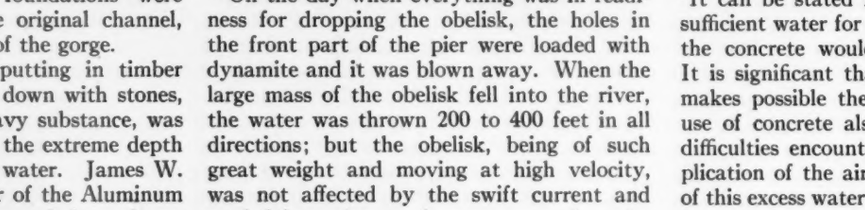
The channel was excavated, and tunnels were built in the permanent dam with large gates capable of carrying 40,000 to 50,000 cubic feet of water per second and passing it through the power house where the first hydraulic turbine was to be installed. Extensive preparations were required. Not only did Mr. Rickey have designs and computations thoroughly checked by his own staff and consulting staffs, but he had models made and moving pictures taken of the tipping of this diverting dam. By means of a slow-motion picture, it was thoroughly studied by all. So carefully was the whole scheme worked out that when this block of masonry—92 feet high, 45 feet wide, approximately 45 feet in the other dimensions, and containing 5,500 cubic yards of concrete—was dropped into the river, it landed almost perfectly in the place in which it was computed to land.

The sketch shows a cross section of the Saguenay River a few hundred feet above the permanent dam, and the relative positions of the diversion channel and the permanent channel that was to be stopped by dropping the obelisk into it. The obelisk was built several months beforehand on the top of a pier composed of two parts. The right-hand part was arranged so it could be shot by a large charge of dynamite, thus leaving the obelisk unsupported on the river side. It was necessary to leave considerable water flowing down the old channel in order to form a cushion for the obelisk to fall into and thereby prevent breaking it. The quantity of water was regulated, and this precaution worked perfectly.

On the day when everything was in readiness for dropping the obelisk, the holes in the front part of the pier were loaded with dynamite and it was blown away. When the large mass of the obelisk fell into the river, the water was thrown 200 to 400 feet in all directions; but the obelisk, being of such great weight and moving at high velocity, was not affected by the swift current and settled into place as it was expected to do, thus becoming the dam.

The entire scheme was a bold one. But it was carried through successfully, and accomplished the complete, satisfactory cofferdamming of a most dangerous and difficult stream of great volume and swiftness of flow. If the reader had been the engineer responsible for the scheme, how would he have felt at the moment that dynamite was set off?

About 70,000 quarts of ink are used annually by the United States postal system.



ENGINEER ENDORSES PRACTICE OF VIBRATING CONCRETE FORMS

THE following letter on a subject of widespread interest recently appeared in the *Engineering News-Record* and was written by James B. Girand of Santiago, Chile.

"Numerous references in *Engineering News-Record* to the practice of hammering concrete forms to assist in producing good concrete prompt me to mention some of my experiences with this type of manipulation and to record my enthusiastic approval of it. My first use of an air hammer on concrete forms was during the construction of a large reinforced-concrete reservoir at Prescott, Ariz., about 1900. I used a plastic mix, which would just flush the water to the surface under spading and tamping. I have continued the use of the air hammer on all important concrete work I have done since, and the results obtained demonstrate that it is almost an essential procedure if maximum density and strength are to be obtained. Probably the good concrete which has been poured without hammering would have been better if the air hammer had been employed.

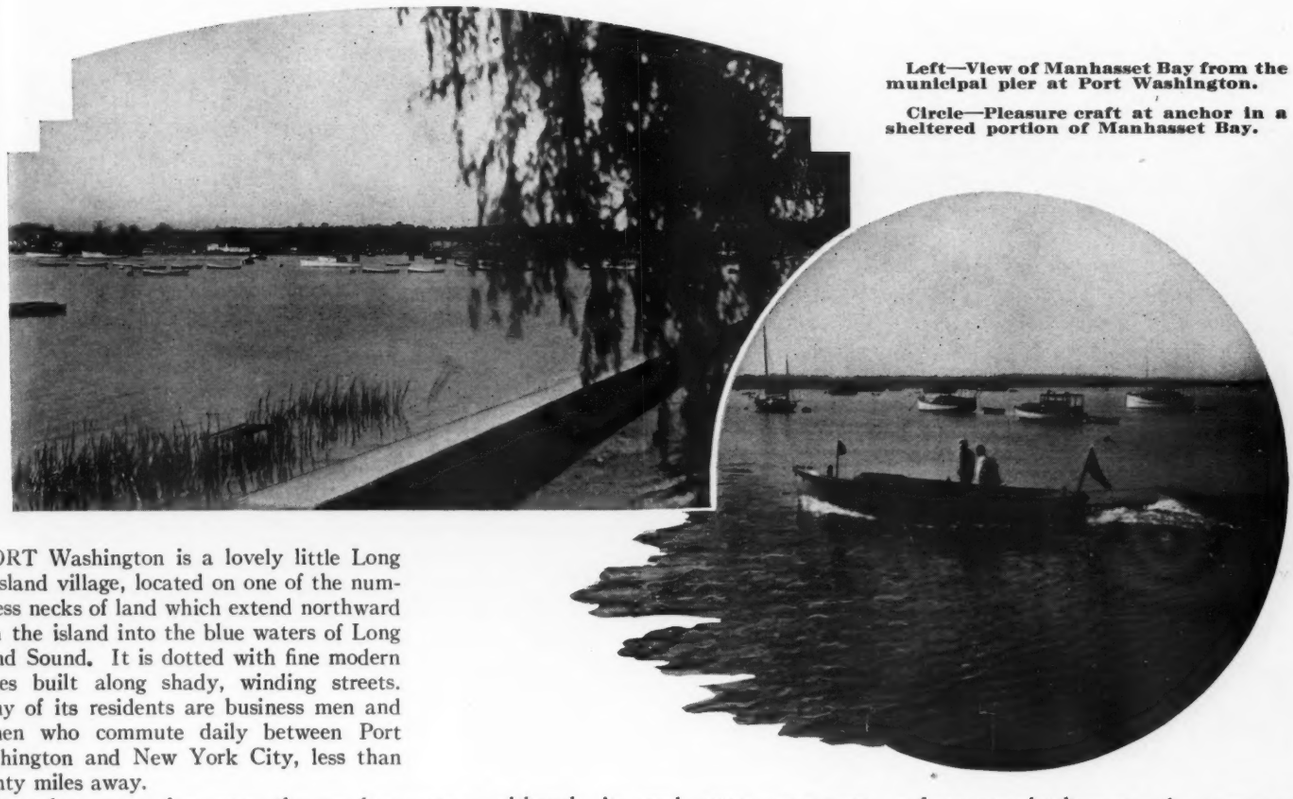
"On page nine of *Basic Principles of Concrete Making*, by F. R. McMillan, is this: 'It can be stated here that were there only sufficient water for the chemical combination, the concrete would be wholly unplaceable. It is significant that this extra water which makes possible the effective and economical use of concrete also introduces most of the difficulties encountered in its use.' The application of the air hammer will bring much of this excess water to the surface, from which it can be removed. Hammering, in addition, removes air, which is harmful in concrete. It is also a fact that much of the uncombined water can be eliminated in the first place, since a drier mix can be used when the forms are subjected to hammering. Although hammering of forms has been used on many projects, to my knowledge no extensive experiments have been conducted to determine its relative benefits.

"One point to be studied is the extent to which concrete can be poured in one continuous block without developing serious stresses from shrinkage and cooling, both with and without the use of the air hammer on the forms. I feel confident that such experiments would add materially to the valuable work already done by Mr. McMillan and others devoted to better concrete."

The first section of the Buenos Aires underground railway has been opened to traffic.

Modern Water System Aids Growth Of Port Washington

By A. W. LOOMIS



Left—View of Manhasset Bay from the municipal pier at Port Washington.

Circle—Pleasure craft at anchor in a sheltered portion of Manhasset Bay.

PORT Washington is a lovely little Long Island village, located on one of the numberless necks of land which extend northward from the island into the blue waters of Long Island Sound. It is dotted with fine modern homes built along shady, winding streets. Many of its residents are business men and women who commute daily between Port Washington and New York City, less than twenty miles away.

Up-to-date stores face upon the one long business street that is so typical of suburban towns. The railroad station is on the west side of this street at about the center of the business district. Well-paved streets lead from the station to all parts of the town and serve as arteries for the daily morning exodus and the evening influx of commuters. At train time the station hums with activity, and the people hurrying to and fro remind one of a hive of bees when clover is in bloom.

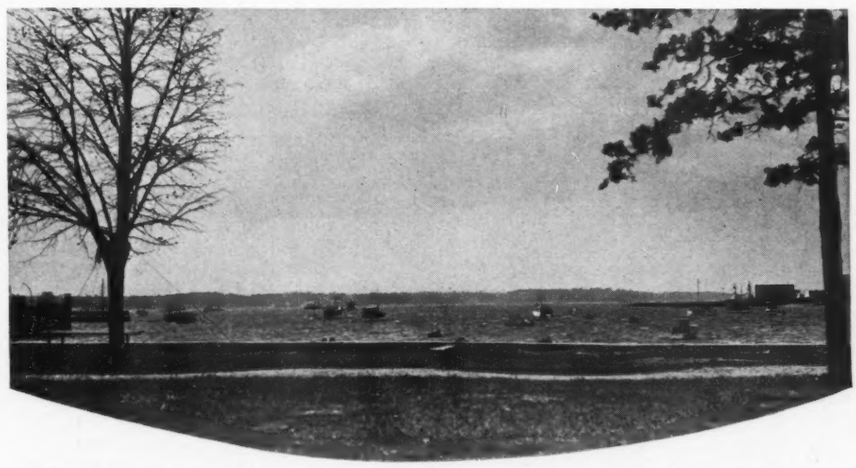
The town abounds in tastefully designed homes of many architectural styles. There are designs of Colonial, Dutch Colonial, English, and Spanish inspiration, and others that can be called only American. These houses, nestling among the trees of a wooded lot, or standing boldly out in the open, harmonize so well with their surroundings that they appear, despite their newness, to be part of the landscape.

Yet, modern as is its present appearance, the history of the town extends back nearly 290 years, although its real estate was once valuable only as a cow pasture. The Town of North Hempstead, of which Port Washington is a part, was settled about 1644, notwithstanding that a party from Lynn, Mass., had landed on the neck some years before.

The neck was early known as Cow Neck, and, as one historian states, was later misnamed Manhasset Neck after a tribe of Indians who never had lived in the vicinity. These first settlers banded together and built a fence completely across the narrow arm of land extending into the sound, and used the area as a common pasturage. Each man's pasture rights were in direct proportion to the number of panels of fence which he had furnished.

It became necessary for the town to pass laws regulating the use of this pasture. At one time they ordered that "noe calves shall be carried downe into the necke, but such as shall have cowes with them to sucke, and if any shall drive downe calves without cowes to sucke, shall fforfeit one-half to him that gives notis." The law did not state what was to be done in case it was necessary to forfeit one-half of a calf.

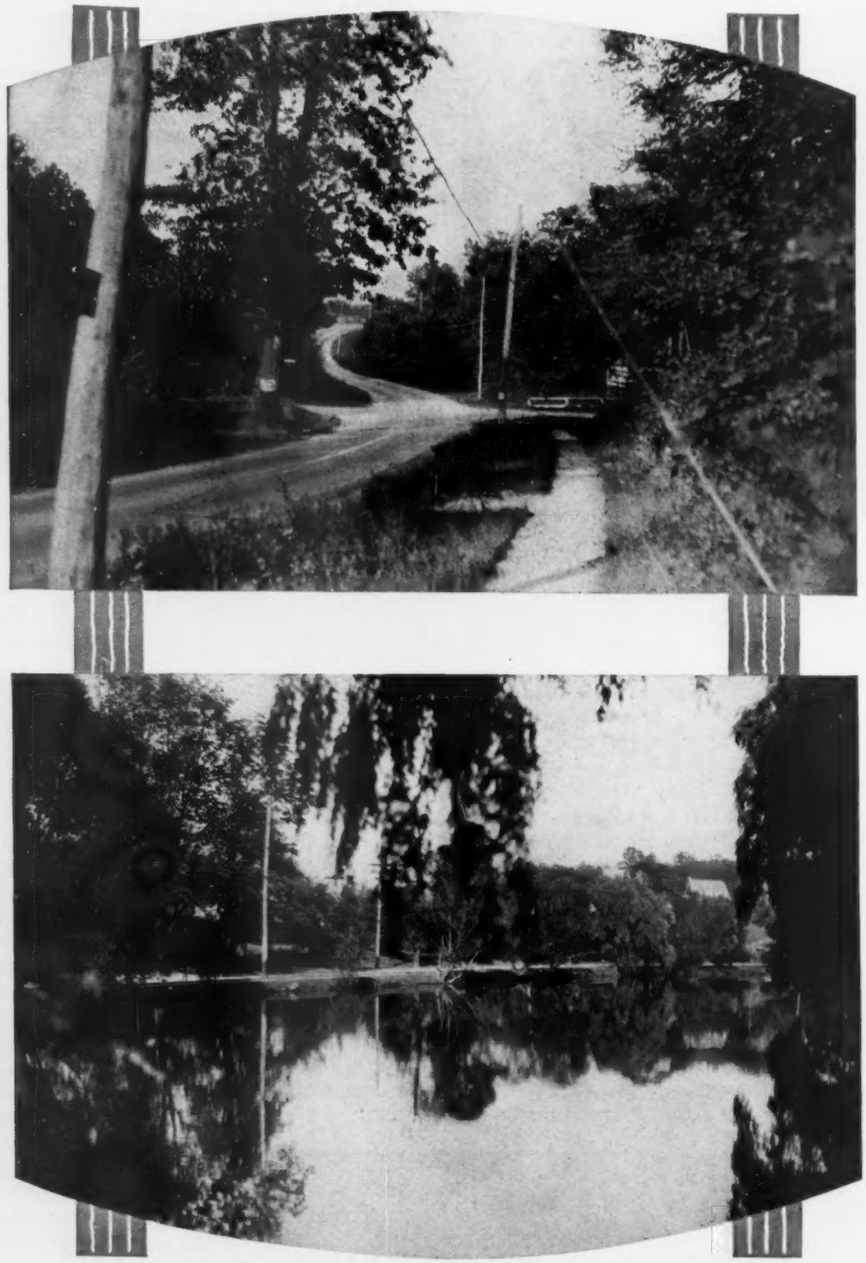
The earliest settlers were Dutch, and it was not until New York, or New Amsterdam, as it was known under Dutch rule, became English territory that English settlers began to outnumber the Dutch. The village was far enough from Manhattan not to actively enter into what little disturbance there was in con-



Part of the bay as seen from one of Port Washington's strategically located parks.

nection with the displacement of the Dutch rule.

Similarly, at the time of the Revolution, it was somewhat outside the main battle districts. However, the town does have a Washington headquarters at which George Washington camped for a short while.



Top—A winding highway in the highest part of Port Washington which, incidentally, is the second highest part of Long Island. Bottom—A willow-bordered lake in a Port Washington park. The stream which feeds this lake flows through the grounds about several private residences.

Port Washington is hilly, but like the rest of Long Island it is comparatively free of rocks. Connecticut, across Long Island Sound, is full of rocks, and the Indians had an interesting legend to explain this fact.

It seems that Long Island had been for a long time the home of the devil, and it was at that time covered with large boulders. The devil, however, tired of the island, decided to cross over into Connecticut. This was not at all pleasing to the Indian inhabitants of that territory, so they drove him back. The devil, naturally, was exceedingly angry, and he took out his spite by picking up all the rocks he could lay his hands on and throwing them across the sound into Connecticut.

Whether or not the devil is to be credited, the fact remains that the rock-free hills around old Cow Bay, now Manhasset Bay, make ideal homesites. The bay and the sound provide excellent facilities for swimming and boating, and a few residents commute to New York in speed boats.

The second highest point on the island, some 285 feet above sea level, is within the village limits, and the residents of this section have an excellent view of the bay and the town below them.

One of the vital requirements of any community is an adequate supply of good drinking water. Port Washington is most fortunate in this respect. It has available from wells a virtually unlimited supply of good clear water which a recent test shows to contain only 2.34 parts per million of solid matter with .037 parts per million of organic and volatile matter. Its permanent hardness, expressed in terms of calcium carbonate, is 4.72 parts per million. Such a degree of hardness is practically unnoticeable, and it is only when water approaches a hardness of 50 parts per million that it commonly receives the appellation "hard water".

The operator at the present pumping plant tells the story of a new resident who had moved from a district having drinking water with a decidedly unpleasant taste. He had formed the habit of drinking bottled spring water, and insisted on continuing this practice after moving to Port Washington.

His wife had to pay for this out of her share of the family budget and, naturally, begrudged the extra expense. One day she filled an empty spring-water bottle from the city supply. Her husband did not detect the difference, and he has been drinking city water ever since.

About 25 years ago Port Washington's first community pumping plant was established. Previous to that time each householder had provided his own water supply. Occasionally one sees an old well house still standing, which testifies to the method once common for securing this supply.

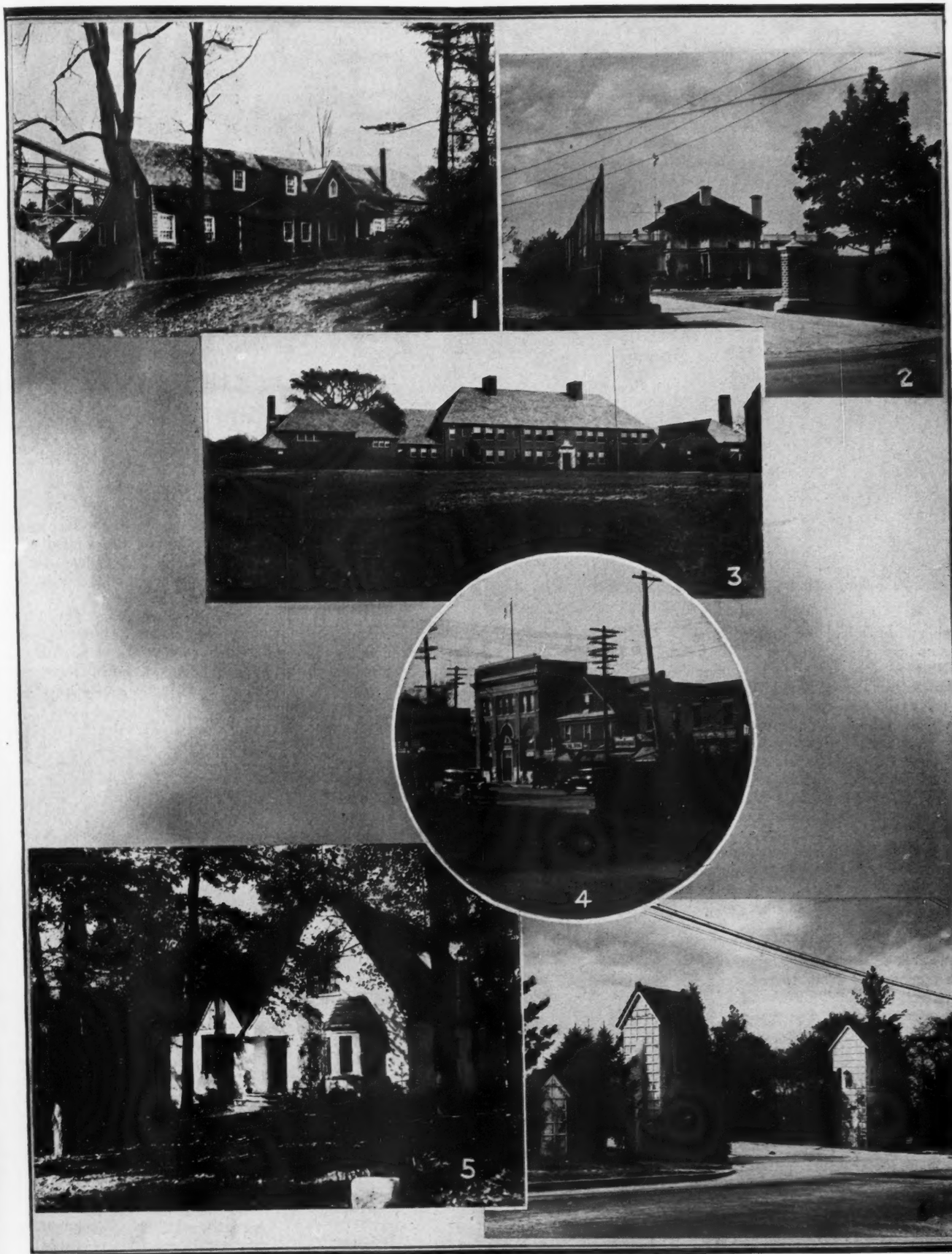
The original community plant consisted of two 250-gallon-per-day pumping units driven by gasoline engines. A few years later it was necessary to increase the size of the plant, and in order to effect economies in operation the original pumps were replaced by direct-acting steam-driven units.

Fifteen years ago a Diesel engine was installed in the plant, and since that time no other type of power has been used except for short periods when steam was used to help carry the peak loads.

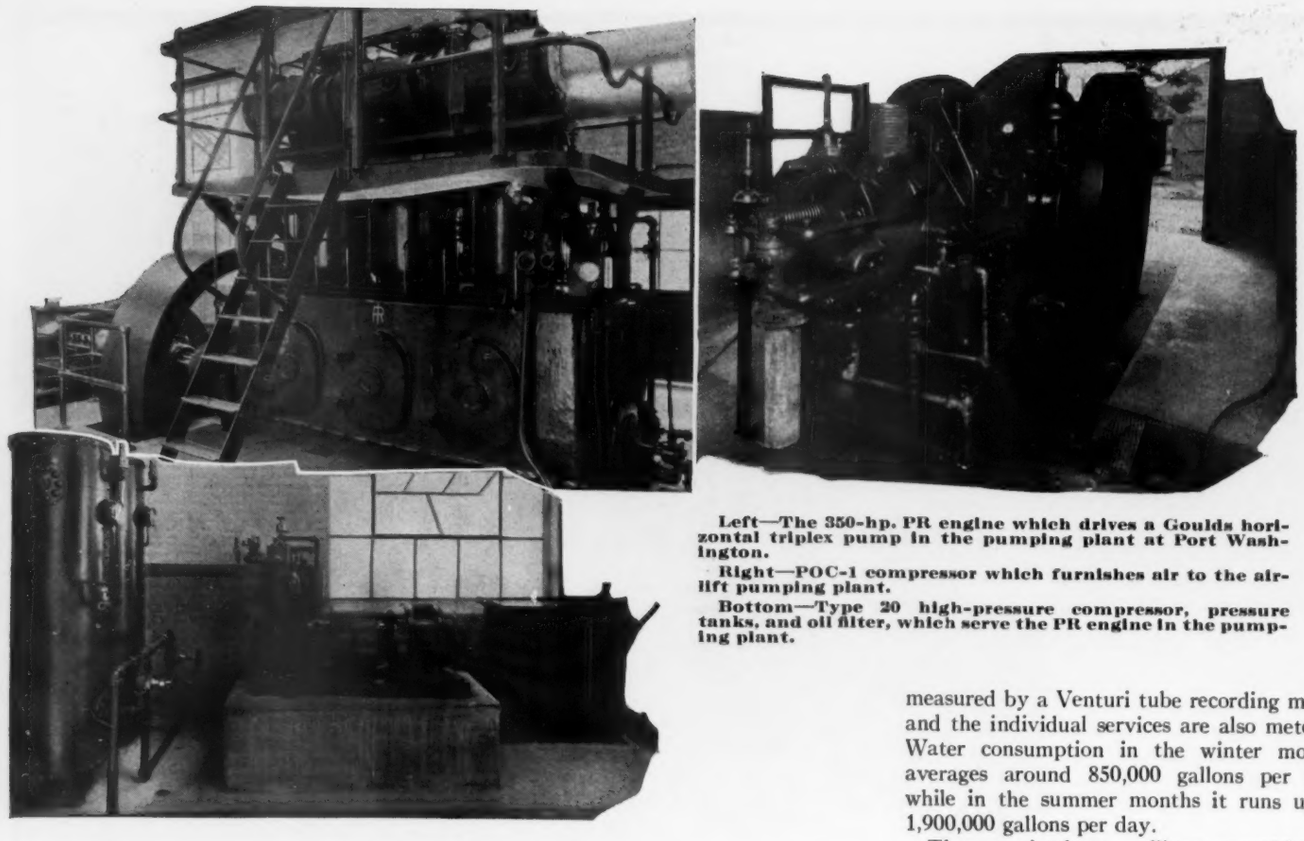
The original oil engine was an 80-hp., horizontal, twin-cylinder machine, and it was direct connected to a vertical triplex pump. This was followed by a 90-hp., vertical, 2-cylinder oil engine, also direct connected to a vertical triplex pump, which was used in connection with the original unit. The plant thus arranged had a maximum capacity of 2,000,000 gallons per day.

In the last ten years the town has grown rapidly and now has a population of 10,409, according to a preliminary estimate from 1930 census figures. The neighboring Village of Sands Point is also served by the pumping plant, and the population of the two villages approaches 13,000.

The water consumption has, of course, increased with the population, and in 1926 the wells in use were augmented by two wells pumped by the air-lift system. The water rises to within 21 or 22 feet of the surface of the ground. Previous to the installation of



1—House in which George Washington is supposed to have stayed—now a residence. 2—One of the several yacht clubs which have fine clubhouses on the east shore of Manhasset Bay. 3—One wing of the new Port Washington High School, which is centrally located in respect to the residence districts. 4—The business district of Port Washington as seen from the railroad station. 5—A residence in Port Washington's hilltop section. Wooded lots and winding streets add to the attractiveness of many of the residence sections. 6—Gate to a private residential park overlooking Manhasset Bay.



Left—The 350-hp. PR engine which drives a Goulds horizontal triplex pump in the pumping plant at Port Washington.

Right—POC-1 compressor which furnishes air to the air-lift pumping plant.

Bottom—Type 20 high-pressure compressor, pressure tanks, and oil filter, which serve the PR engine in the pumping plant.

the air lift all wells had been pumped direct. It was found that the air lift gave an increased water yield.

Air for the two new wells was supplied by a POC-1 oil-engine air compressor delivering 410 cubic feet of free air per minute at 55 pounds per square inch pressure. Last year it became necessary to further augment the supply, and an entirely new plant was built with ample provision for future increases.

There are at present seven wells—five pumped by direct lift and two by air lift. A 12x20 horizontal triplex Goulds pump with a capacity of 3,000,000 gallons a day pumps the water from the wells directly into the mains. A wet vacuum pump is included in the system for removing any air from the water before it reaches the triplex pump. Both the water and the vacuum pumps are driven by an Ingersoll-Rand solid-injection Diesel engine rated at 350 hp. The triplex pump is geared directly to the Diesel engine, and the vacuum pump is driven through an extension shaft. A 2-stage Type 20 furnishes starting air for the engine.

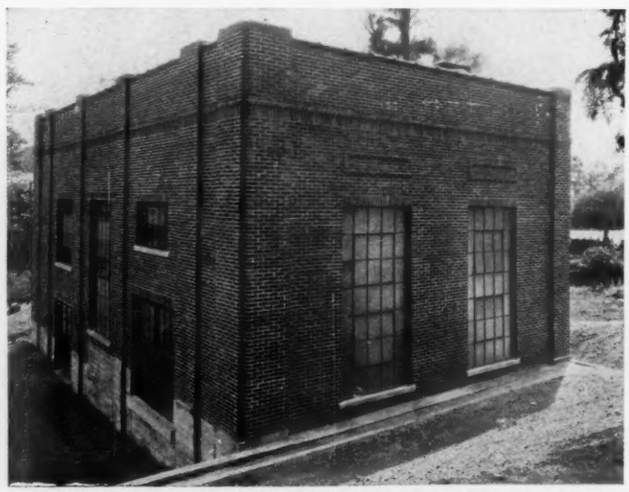
The new equipment has been installed in a modern brick building a few hundred feet from the old plant. The old building still houses the POC unit which supplies air for the two air-lift wells. At the present time, these two wells are used only when the demand is greater than the capacity of the other wells. In the summer, the air lift is in operation almost constantly, but in the winter, when the demand is not so great, the other wells ordinarily meet the load requirements.

There are two separate systems of water mains leaving the plant, one, serving the higher part of town, in which the pressure at the plant is from 125 to 175 pounds per square inch. An elevated tank in this system keeps the pressure constant and takes care of peak demands. The other system serves the low-lying sections, and the pressure at the plant is from 90 to 125 pounds per square inch. There is a standpipe in this system for steadying the pressure.

All water leaving the plant is accurately measured by a Venturi tube recording meter, and the individual services are also metered. Water consumption in the winter months averages around 850,000 gallons per day, while in the summer months it runs up to 1,900,000 gallons per day.

There are in the two villages served by the plant many fine lawns on which much water is used in the summertime, as well as a polo field, three golf courses, and three swimming pools, all of which greatly increase the hot-weather water consumption.

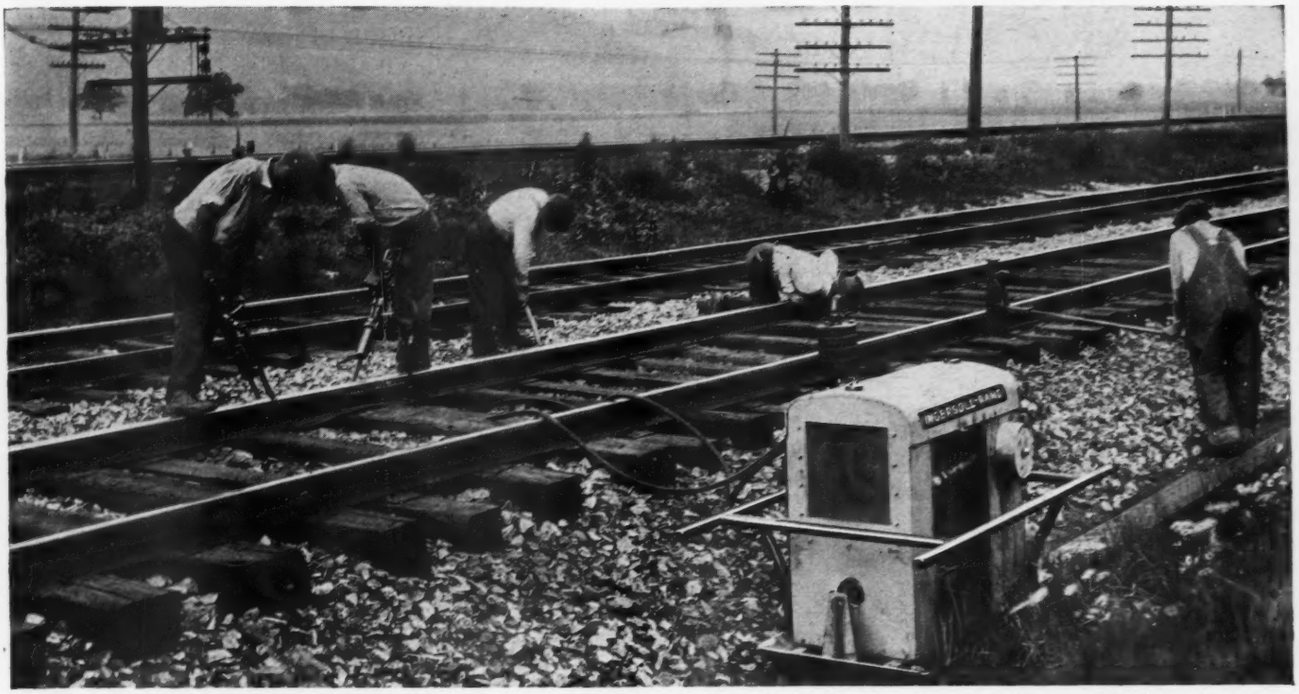
Blessed with an abundance of natural beauty, extraordinary opportunity for water sports, and an unusually potable and easily available water supply, it is not surprising that Port Washington has developed rapidly into a high-class residence town. The well-designed pumping plant, a modern new high school with ample playground facilities, well-paved streets, a busy airplane and seaplane port, give ample evidence of the fact that these natural advantages are being augmented to the utmost with many-sponsored additions.



New pumping station at Port Washington. This plant houses a 350-hp. PR engine and a 2,000-gallon-per-minute Goulds horizontal triplex pump.

WRITTEN MESSAGES BY PHONE

IT has latterly been reported from Switzerland that two native engineers have succeeded in developing an apparatus—said to be very simple in construction—that makes it possible to transmit written messages by means of a dial telephone in the event the subscriber called does not answer. By the use of a plug, the dial can be quickly and easily transformed into an automatic telegraph instrument that permits the sending of a wide range of messages of unlimited length. The messages are in code numbers—the nought being used as a separating sign between words.



Picking up low spots in track with the new "Spottamper". The handy portable will also serve the maintenance-of-way man in numerous other ways.

"Spottamper" a New Small-Size Unit For Track Maintenance

FROM the railroadman's standpoint the new "Spottamper" compressor, built and recently put on the market by the Ingersoll-Rand Company of New York City, is a welcome addition to his equipment. It fills a long-felt want in that it obviates sending out a large-capacity tie-tamper compressor for work that can just as well be done by a unit of comparatively small size. The "Spottamper" is a small-capacity, compact, portable outfit that was primarily designed for use in spot-surfacing track, an operation that requires the services of but two tie tampers. Its usefulness, however, is not confined to furnishing air for tie tampers. A portable of this type may be employed to advantage in connection with other pneumatic tools for track or structural work, whitewash- and paint-spray machines, spray nozzles for oiling track joints, and to supply compressed air for blowing snow out of frogs and switches, for testing electro-pneumatic signals—in fact, for doing all sorts of light yard and maintenance-of-way jobs.

The new portable has an overall length of 6 feet 4 inches, a width of 3 feet 3¾ inches, and a height of 4 feet 6 inches. It consists of a 2-cylinder compressor and a 2-cylinder gasoline engine which are entirely encased in metal and securely mounted in a steel pan equipped with rollers. These, together with tubular hand rails, enable a working gang to readily move the "Spottamper" from one point to another by way of either the rail or a plank provided for the purpose.

One of our large railroads, which has tried out the "Spottamper" under regular service conditions, has this to say regarding its use in "picking up" low spots in track: "With an organization of one foreman and four men—no special operator being required—one mile of track was covered in five days with an average of 208 ties tamped inside and out and with an average of 52 joints and low spots raised daily. The gasoline consumption has averaged one gallon per hour.

"We have found that we can best use the machine by operating it on planks on the subgrade berm, wedging it in place to hold it vertical, and placing it on the rails only when it is moved any distance. We have been able to adjust the method of handling by means of planks so that it can be taken off the track in 45 seconds. The mechanical operation of the machine has been very good. It has been holding a constant pressure. It is more economical than hand tamping with picks."

The "Spottamper" is suitably equipped with rollers so that two men can easily move it along on a rail.

In this age of color it is interesting to note that a manufacturer of direct-current motors is now turning out his product with windings coated a bright orange. This, however, is not done to please the eye but to reveal trouble-making dirt. Most motor windings have a black finish, on which dirt goes more or less unnoticed with the result that they are not cleaned as frequently as they should be for most efficient service. Besides making it possible to detect dirt at a glance, the orange-colored enamel, which is free from conductive solvents, is said to be a good insulator because it offers more than the usual resistance to water, oil, and acid.

New Method of Pier-Sinking Makes Use of the Air Lift

By A. M. HOFFMANN

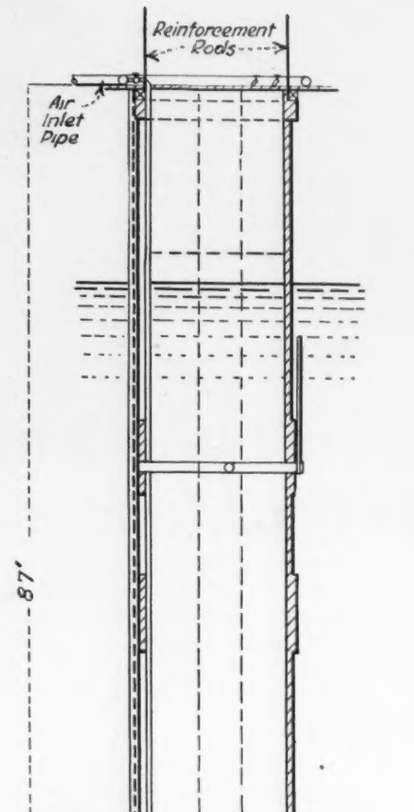
IN line with a project of general port improvement undertaken by the French immediately upon the cessation of hostilities, the harbor works of the inland city of Bordeaux are being modernized and expanded to take care of a steadily increasing traffic, as well as a traffic for which it was originally not equipped. The city is situated on the Garonne immediately above the point where that stream and the Dordogne meet to form the Gironde River, which empties into the Atlantic Ocean about 60 miles away. This entire stretch of waterways virtually constitutes the Port of Bordeaux, and is embraced in the program of development.

The program includes the reconstruction of some of the wharves at Bordeaux; the laying out lower down on the same bank of the Garonne of new basins to connect with the wharves by means of a wide lock; the rebuilding of the piers that were put up during the war at Bassens on the opposite side of the river; the creation of an oil port at Bec d'Ambés at the confluence of the Garonne and the Dordogne; the establishment of a floating-dock station at Pauillac, about midway between Bordeaux and the Atlantic; and the construction of a mole at Le Verdon, at the mouth of the Gironde, making it a port of call for passenger liners docking at Bordeaux. This step has been necessitated by reason of the fact that present-day larger and deeper-draft vessels cannot proceed up the river until they have been lightened by the discharge of their passengers and some of their freight.

Since 1925, when Bordeaux, like Havre and Strassburg, became a self-governing port, the work of harbor improvement has progressed rapidly. While it has many interesting angles, we shall concern ourselves at this time only with one phase of the operations at Le Verdon, where the mole is being built. Along that stretch of the Atlantic the water bed consists of very fine sand varying in depth from 22 feet to 32 feet. Underlying this shifting mass is a thin layer of gravel followed by a stratum of compact clay 20 feet in thickness. Down and into this latter formation the piers for the mole and the viaduct leading up to it are being sunk by a method conceived by Monsieur Caquot, chief engineer of bridges and highways. The method is a novel one, and an adaptation of the air-lift system of raising water—in this case raising both water and solids mixed with it.

Instead of using caissons, which it was believed would prove too costly at that exposed position, Monsieur Caquot is having made great cylinders of strongly reinforced, quick-setting concrete. These constitute the outer shells of the piers. Each cylinder is 87 feet long, 13 feet in diameter, and 5.9 inches thick, and weighs 280 tons. They are taken to the site by a specially built 300-ton floating crane that also serves to lift them and to hold them in an upright position for lowering.

At the bottom of each cylinder or shell, as indicated in the accompanying vertical-section drawing, is a bell-shaped chamber terminating in a cutting edge. This chamber connects with a tube, 3.6 feet in diameter, that leads up through the center of the cylinder. A siphon communicating with the outside keeps the tube and chamber filled with water. Three exhauster pipes, each 10 inches in diameter, reach from the top to the bottom of the shell, thence enter the excavating chamber, and, finally, penetrate the sea bed. These pipes are placed 120° apart. Passing down within each exhauster pipe and concentric with it is a compressed-air pipe that is closed at the bottom but is perforated a short distance up therefrom with 35 holes each having a diameter of approximately ⅛ inch.

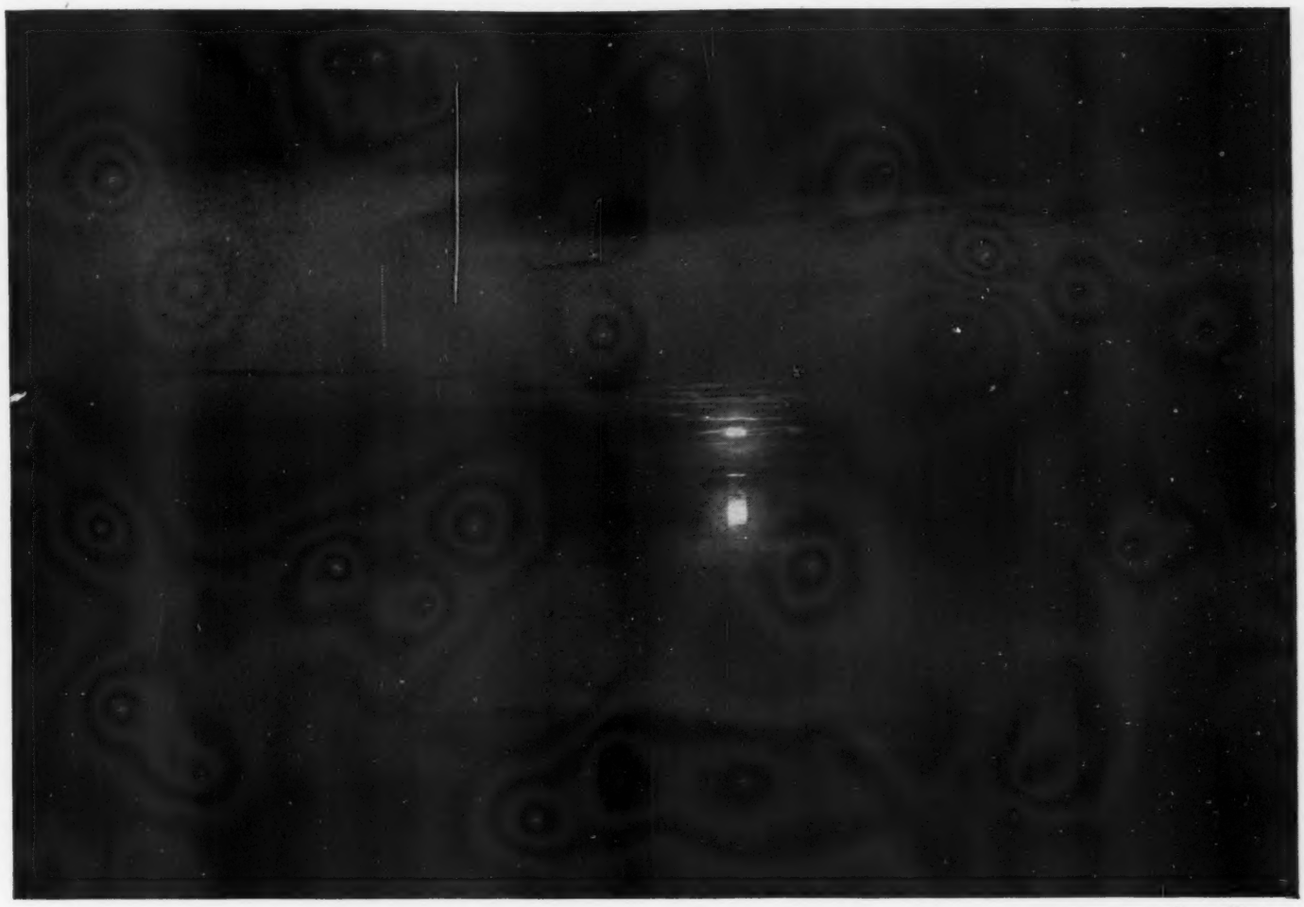


Vertical section of the type of concrete cylinder which is being sunk through sand and gravel by the use of the air lift.

In seeking to escape through these apertures, the high-pressure air induces a strong upward movement of the water in the exhauster pipes, carrying surfaceward with it the sand and the gravel lying within reach of the mouths of the exhauster pipes. Thus, by removing the material beneath it, the concrete cylinder is caused gradually to sink. By regulating the flow of compressed air at the surface—that is, by admitting air to one or the other of the three pipes, it is possible to control the excavating so as to make the cylinder settle perpendicularly. Boulders and other obstructions have, occasionally, interfered with operations; but these have in every case been removed by divers entering the bottom chamber. When it has come to rest, the cylinder is filled with concrete.

The cylinder or shell as now used and its method of sinking are the outcome of considerable experimenting; but it is said that all the difficulties experienced at the start have been overcome and that the work is progressing rapidly, as well as economically. The mole is to have a length of 785 feet, a width of 125 feet, and will be supported by 36 piers set in three rows of twelve each. At low tide the water alongside will have a depth of approximately 40 feet, which is ample for the docking of the new liner *Atlantique* which is to be put in the Bordeaux-South America service in September of 1931, the date set for the completion of the project now in hand at Le Verdon.

It has been estimated by the Government Foodstuffs Division that the present yearly per capita consumption of canned goods in the United States amounts to about 1½ cases, or a matter of 54 cans. According to the latest statistics, the production of canned foodstuffs is about five times as large today as it was 25 years ago—the annual output having increased from 41,000,000 to about 200,000,000 cases. All but three of our states contribute to this total.



Midnight sun glowing above the Arctic waters of Alaska. Lomen Bros

Reindeer Have Brought Riches to Alaska

Introduction of These Animals to the Territory Has Led to Very Substantial Economic Betterments

By JOHN DOE

"WHEN what to my wondering eye should appear,
But a miniature sleigh and eight tiny reindeer,
With a little old driver, so lively and quick
I knew in a moment it must be St. Nick.
More rapid than eagles his coursers they came,
And he whistled and shouted and called them by name:
'Now, Dasher! now, Dancer! now, Prancer and Vixen!
On, Comet! on, Cupid! on, Donder and Blitzen!"

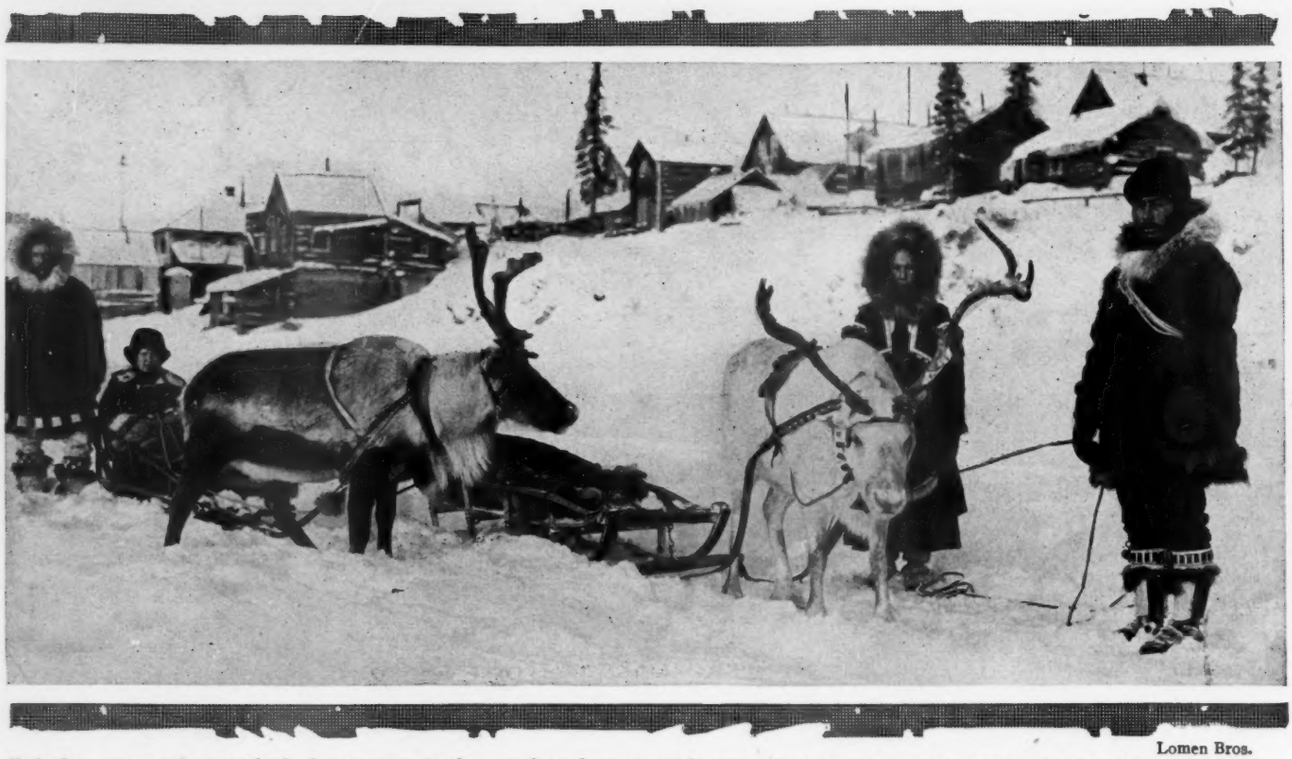
Thus Clement C. Moore introduced to our youthful minds a picture of St. Nick and his reindeer team drawing speedily a sleigh laden with just those particular toys that each of us had besought him to bring us by way of reward for a very trying period of good conduct. To most of us reindeer then had no other service to perform than that incident to the annual Christmas visitation. Between times, according to our juvenile conception, the reindeer dwelt somewhere in the far-away frozen North—all quite mysterious but yet believable.

The intervening years have brought about material wonders in place of poetic fiction; and today in our distant Northland there are hundreds of thousands of reindeer that play a very important and beneficial part in the lives of many of the people who live near or upon the far-flung tundra of Alaska. They are there today bringing about a sociological and an economic transformation all because certain white men dwelling in Alaska for the good of the natives were inspired to introduce a few reindeer into that Territory from the neighboring coast of Siberia. It was their effort to solve a desperate and vital problem that concerned the survival of the Indians and the Eskimos in a land where they had so long dwelt.

The influx of white men, with the ever-widening use of firearms, reduced at a disastrous rate the wild creatures upon whom the Indians and the Eskimos had previously counted upon for subsistence; and more than once the aborigines had to battle with the menace of starvation during the dark and bitterly cold months of wintertime. The situation was further aggravated when the white man devised wholesale ways to catch salmon and other aquatic creatures and to send them in increasingly large quantities to consumers outside of Alaska. Something radical had to be done that would alter the outlook and yet give the Indians and the Eskimos the means wherewith to live in their accustomed environment but under very much improved conditions.

It was with this same thought in their respective minds that W. T. Lopp and Sheldon Jackson urged virtually at the same time that reindeer be brought to Alaska across Bering Strait so as to start their propagation in the Territory. Both Doctor Jackson and Mr. Lopp were aware that reindeer had been used for centuries as domesticated animals by other peoples dwelling in the Arctic and subarctic sections of Europe and Asia; and it seemed perfectly logical to those men that the immense barrens of the northwestern part of Alaska could also be counted upon to sustain great herds of reindeer and give to the nomadic natives an economic stability that would fix them happily in a congenial environment. There were no good reasons why reindeer in Alaska would not be a source of income, food, and clothing for the native just as the same creatures were in Siberia.

Appealing ineffectually to the Congress for funds, Doctor Jackson was able, however, to obtain $2,000 privately; and with that money he purchased sixteen reindeer from reluctant owners after a long cruise on the



Lomen Bros.

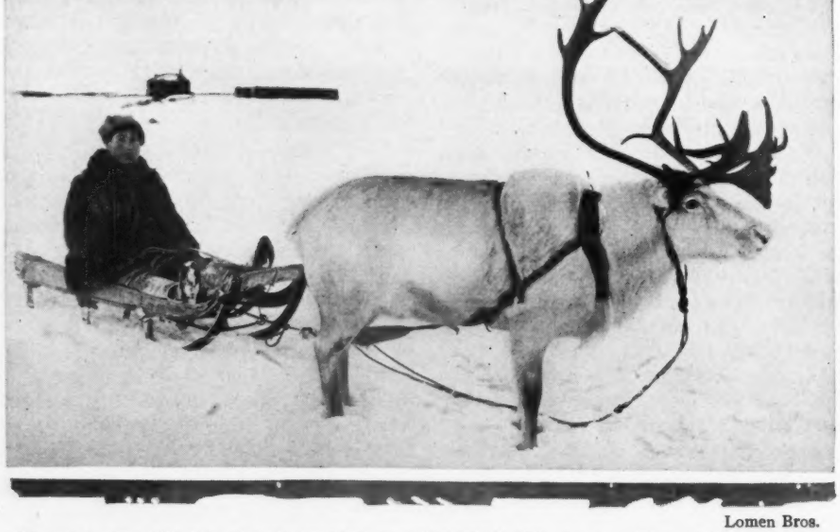
Reindeer are used extensively for transportation work and are notably superior to dog teams for hauling when the ground is not covered with snow.

Siberian coast. Those reindeer were transported to Alaska aboard one of the vessels of the U. S. Revenue Cutter Service. That was in 1891. Three years later, Congress appropriated $6,000 to carry on the work; and subsequently provided larger and larger sums which totaled in 1903 a matter of $158,000. At the close of 1902, the reindeer thus imported aggregated 1,280 head. These figures are significant when we are reminded that there are today in Alaska—the vast majority bred there—between 900,000 and 1,000,000 reindeer. At an average value of $25 a head, it is plain how profitable the undertaking has proved if measured only in dollars and cents. But that is by no means the most valuable of the results.

The introduction of the reindeer and the gradual increment of the various herds have completely revolutionized the social and economic status of the benefited natives. They have acquired the pride which comes with the possession of property; they live today as they did not live in the past; they are self-sufficient; they have responded to education and, in a broad sense, can properly be called civilized; and they are a national asset, playing as they do a very helpful part in the general development of Alaska. Further than that, the reindeer of the Territory bid fair to be a steadily growing source of appetizing meat for the nation at large.

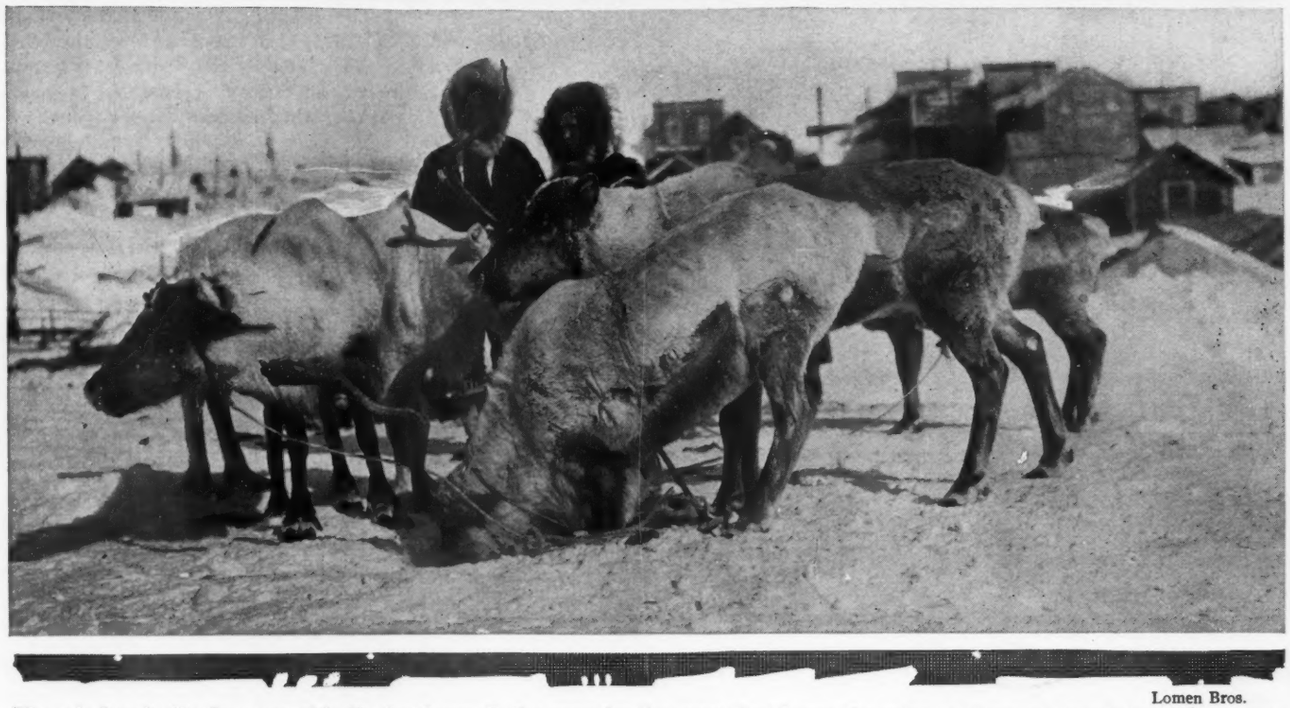
Early in the days of the importation of reindeer, the Federal authorities recognized that the natives would have to be trained in the herding and handling of the animals; and, accordingly, a number of Lapland herders—a people long familiar with the domestication of reindeer—were introduced, and those people have done a worth-while part in promoting the whole undertaking which has largely been under the supervision of the United States Bureau of Education. Up to a point the Laplanders answered admirably, but they could not deal with certain diseases and difficulties that developed—more or less peculiar to the Alaskan environment. The herds, which had flourished to a marked degree, were threatened with grave diminution and, possibly, extinction. Then it was that the Biological Survey of the United States Department of Agriculture was appealed to; and that organization began its work in 1920. The Survey has continued its activities there ever since, and has accomplished much in behalf of the reindeer industry. Many problems have been studied, and successful solutions for most of them have been found.

The whites in Alaska own only about one-third of the reindeer—the remaining two-thirds of the animals being owned by natives. This is as it should be in view of the fact that the movement was originated to help the Indians and the Eskimos living in the Territory. Even so, the white owners have been at the forefront of all efforts to improve conditions and to safeguard the herds. The Lomen Brothers have been conspicuous in



Lomen Bros.

Every native Alaskan herder makes a point of breaking a number of his reindeer to harness.



Lomen Bros.

The reindeer in the foreground is digging beneath the snow for the moss that forms the principal item of the winter diet of these very useful animals.

these activities. This does not mean that the natives have lagged in appreciation of the work done in their behalf, nor have they been slow in adopting the recommendations of the various experts engaged by the Biological Survey.

The Alaskan reindeer is the offspring of the Siberian caribou; and in Siberia there are several breeds of the animals. The United States Government experts are intent upon improving the strains in the Territory, and systematic efforts are being made to cross the reindeer with the native wild caribou. A group of something like 100 animals is being used in the experimental investigations underway at the Fairbanks Station of the Biological Survey. Fawns resulting from this crossbreeding are said to be 5 pounds heavier when born than those of full reindeer parentage. In this way, it will probably be possible to produce larger, stockier, and sturdier animals that will be capable of providing more marketable meat and be less likely to suffer from the accidental breaking of bones. Animals so bred will be still better suited to transportation service. Some extremely fine sled deer have resulted from the crossbreeding of the reindeer and the caribou.

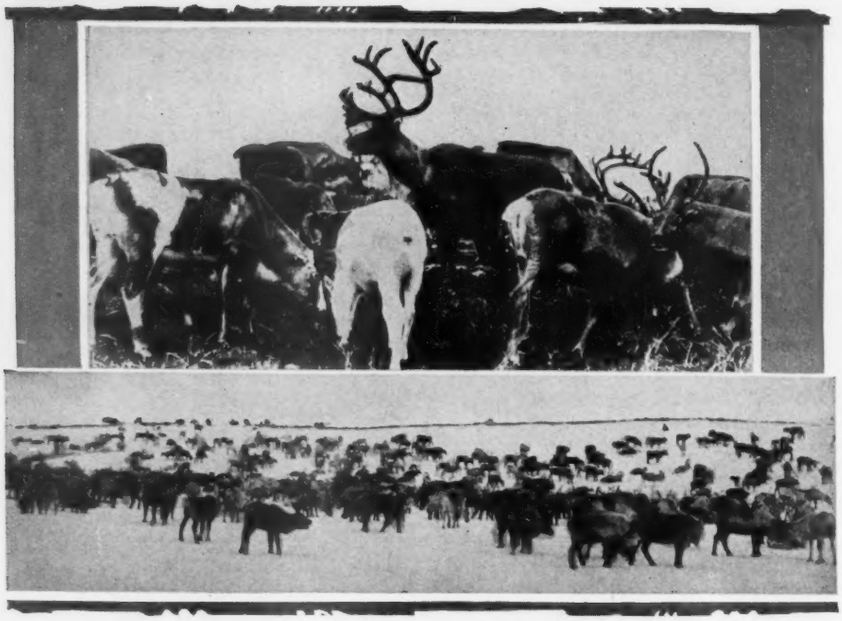
Keystone View Co., Inc.

A reindeer mother standing watch over her new-born fawn, which lies huddled at her feet.

In the summertime the reindeer feed upon grass, young willow growths, and other seasonal green stuff, together with forms of lichen that flourish in the region. In the wintertime the animals depend in the main upon what is known as "reindeer moss"—a lichen-like vegetation that covers the tundra and which the reindeer reach by digging down to it through the snow. One of the subjects studied by the Biological Survey is the range, as well as the distribution and abundance of the lichens that grow thereon. It is necessary to consider the supporting capacity of a range and to ascertain how soon it will recover its food possibilities after a herd has been living upon it. One line of investigation includes the experimental feeding of the reindeer with grains and other rations in an effort to develop sled animals that will be able to transport freight and supplies in areas where lichens are not available. The reindeer is a useful draft animal at all seasons, while work dogs can be used effectively only in wintertime.

Estimates differ as to the extent of the annual increase of Alaskan reindeer herds—some persons give it as 20 per cent while there are other well-informed Alaskans who figure it at about 35 per cent. In either case, it is manifest that the herders have for sale yearly several hundred thousand carcasses; and the Federal authorities are coöperating in an effort to stabilize the business through cold-storage plants and transportation facilities that will enable the reindeer raisers to get their surplus to outside markets.

During the last few years, reindeer flesh has become well known on the Pacific Coast, and it can now be purchased on our eastern seaboard—indicating how distribution has broadened. A reindeer dressed will weigh



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Top—Close-up of a number of reindeer grazing upon an Alaskan pasture in the summertime. Bottom—Part of a large herd of reindeer on a snow-covered range at Port Clarence, Alaska.

from 150 to 175 pounds. The United States Department of Agriculture, in a praiseworthy effort to popularize the meat of the reindeer, has issued a leaflet containing a goodly number of recipes; and that publication informs us that reindeer meat, in its proximate composition, differs little from beef or veal of the same grade. In general, it contains less fat and slightly more protein. The flavor is characteristic, differing in this from beef or veal. It is gamy but not strong. The texture is fine and most of the meat is tender.

As the Biological Survey has extended its work, larger and larger has been revealed the immense area within which the grazing of reindeer herds may be found practicable; and there is a growing belief that ultimately the region lying between Point Barrow and the Aleutian Peninsula will be able to support a total of 10,000,000 of these valuable animals. At present, the majority of the herds, so it seems, thrive adjacent to the seacoast; but there is a well-founded opinion that the ranging area can be considerably expanded by the artificial distribution of salt, which the creatures need. Whatever may be the outcome of this splendid industry, the fact remains that the introduction of reindeer in Alaska has brought in its train a boon not only to the young and to the mature of that region but, potentially, to the nation at large—differing in this respect from the gifts distributed annually by St. Nicholas and his fanciful team.

Following in the footsteps of the developers of Alaska's reindeer herds, Canada, after exhaustive research, decided to plant herds of the same creatures in an area of 15,000 square miles lying to the east of the Mackenzie River delta and inland from the Arctic Ocean. Accordingly, the Dominion Government purchased in Alaska a herd of 3,000 reindeer. The animals are now on the long trek to the new grazing area, and should reach their destination some time next spring. The primary purpose is part of an elaborate scheme to provide new sources of food and clothing for Canada's native population in the far north, and so promote the exploitation of the great and varied resources of that territory at the hands of a robust and vigorous people who will thus be aided in establishing permanent settlements.

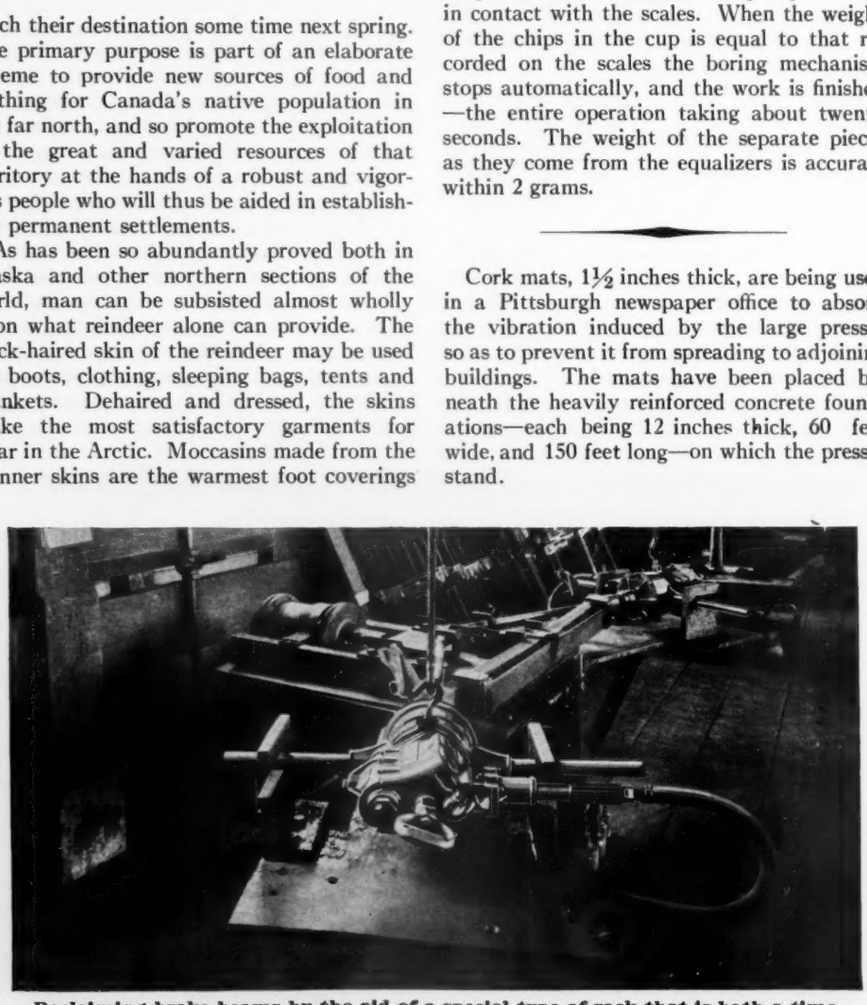
As has been so abundantly proved both in Alaska and other northern sections of the world, man can be subsisted almost wholly upon what reindeer alone can provide. The thick-haired skin of the reindeer may be used for boots, clothing, sleeping bags, tents and blankets. Dehaired and dressed, the skins make the most satisfactory garments for wear in the Arctic. Moccasins made from the thinner skins are the warmest foot coverings known in the north. Heavier skins furnish soft and flexible overclothes that are beautiful in appearance and quite windproof. Indeed, the skins yield materials for many other purposes. The does provide fresh, rich milk from which an excellent cheese can be made. No wonder the reindeer has gained steadily in value since it was first given a foothold on this continent less than 40 years ago.

MACHINE STANDARDIZES WEIGHT OF PISTONS

A WEIGHT-equalizing machine that is a combination scales and boring mechanism has been designed and built at the Rouge plant of the Ford Motor Company to facilitate the work of finishing pistons so that they are standard in the matter of weight. Ten of these labor-saving devices are now in use there, and each has its own operator.

As the completed but slightly overweight pistons are delivered to a machine each is weighed on the delicate scales, which is then set accordingly. Next the piston is placed in the machine, which proceeds to remove bits of metal from its inner walls. These bits drop into what is called a "chip cup" that is in contact with the scales. When the weight of the chips in the cup is equal to that recorded on the scales the boring mechanism stops automatically, and the work is finished—the entire operation taking about twenty seconds. The weight of the separate pieces as they come from the equalizers is accurate within 2 grams.

Cork mats, 1½ inches thick, are being used in a Pittsburgh newspaper office to absorb the vibration induced by the large presses so as to prevent it from spreading to adjoining buildings. The mats have been placed beneath the heavily reinforced concrete foundations—each being 12 inches thick, 60 feet wide, and 150 feet long—on which the presses stand.



Reclaiming brake beams by the aid of a special type of rack that is both a time and a labor saver in the railroad car shops where it has been built and put in use for this particular service. Note the two suspended Ingersoll-Rand air motors—one at either end of the rack. These furnish sufficient power to remove with ease 1¼-inch nuts from brake rods that have been in service for years.

Canadian Railway Has Made the Pneumatic Tie Tamper an All-Year-Round Tool

By D. P. ALFRED

IN Canada and in the northern sections of the United States, as well as in other countries in similar latitudes, ice and snow hinder railway operations to a considerable extent during four, five, and even more months of the year. The majority of people think of snow in relation to railroading only as it affects train movements, and they believe that the passing of a snowplow over buried tracks is all that is necessary to insure the maintenance of running schedules.

There is another angle to the problem of snow and ice removal, however, which is not apparent to the man in the street, and which constitutes an important phase of the winter operations of railway-maintenance-of-way engineers. This has to do with railway yards, roundhouses, and terminals, where leads, switches, and frogs—sometimes numbering hundreds—have to be kept free of accumulations of snow and ice, which latter is largely formed by the drip from locomotives and cars.

Various means and methods of getting rid of snow and ice and of keeping track intersections in working order have been tried out. These include the steam jet, gas or oil burners, and hand picks, bars, and shovels. But in most cases where these have been applied the cleaning process has been a laborious and, without exception, an expensive one that has added no small cost item to the statements covering yard, roundhouse, and terminal operations.

In an effort to do this work with the necessary dispatch and at a reasonable cost, the officials of the maintenance-of-way department of the Canadian Pacific Railway hit upon the idea of using for the purpose compressed air—that is, a standard portable railway compressor together with pneumatic tie tampers. Experiments with such an outfit were conducted during the winter of 1929-1930 at its Glen Yards, adjacent to the Montreal terminal, where passenger rolling stock is accommodated and made up. So successful was the showing made that the use of the equipment by the Canadian Pacific for snow and ice removal, as specified, is now general practice. And it should be added that tie-tamper outfits, the services of which are ordinarily confined to summer operations, have thus been given year-round work to do.

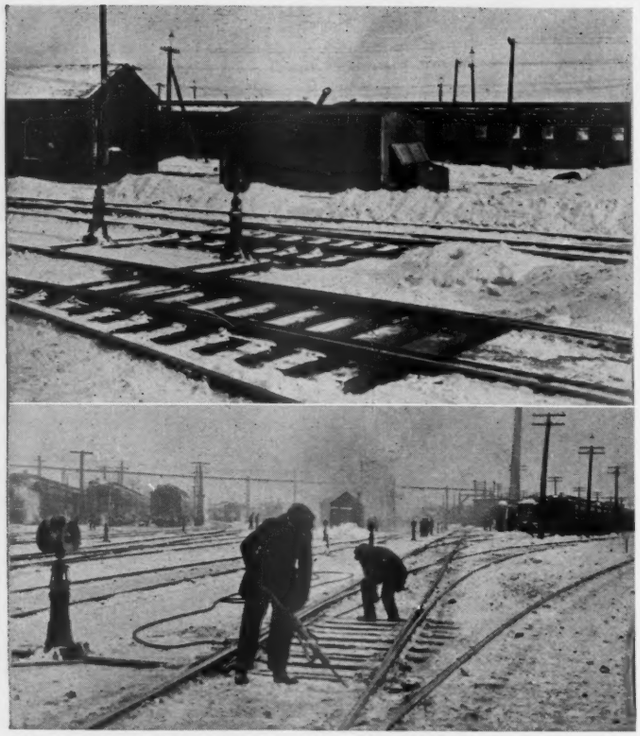
For the tests, a Canadian Ingersoll-Rand 7x6-inch self-propelled tie-tamper compressor was placed in a small house in the center of the yards, and 2-inch supply piping was laid alongside the tracks to various points. As the method gave more and more satisfaction the piping was extended until, at this writing, it has been carried to 33 switches. For every 100 feet of air line there is a globe valve together with a coupling to which a 50-foot length of hose can be attached.

The work, itself, is done by standard Ingersoll-Rand tie tampers, such as serve during the summertime to tamp rock ballast. But instead of employing the regular tamping bar, with its flat face, the bar used has a fairly sharp cutting edge while still retaining the characteristic curve at the end. Further experimenting has indicated that a toothed rather than a plain bar is even more effective. Hence a bar with three teeth—namely, three cutting points, has become standard. The face width of the bar remains the same—3 inches, although some wider faces were tried with good effect under certain conditions. The curve at the end of the bar permits the operator to free the ties of their accumulations of ice with a slicing action. The ice is removed clear down to the wood; but, as the curve is sufficiently pronounced, there is no danger of a tie being split or splintered. Between the ties, the tool, with apparently no effort, breaks away the ice in chunks that can be readily shoveled out.

The use of pneumatic tie-tamping equipment for ice-cutting at the Glen Yards has resulted in a reduction of about 25 per cent of the force heretofore employed on this work and a cut in cost of approximately 60 per cent. It should, however, be understood that such large savings are possible only where there is a concentration of switches over which there is a heavy movement of passenger equipment that necessitates almost daily cleaning out of the switches and the turnouts. But, undoubtedly, substantial economies can be effected by a general application of the method outlined wherever conditions may warrant it.

The foregoing figures are based on a per diem overhead charge of $8.89 for the use of the equipment—the operating cost per day, including wages, being $17.37. The daily overhead charge is based on a 160-day working year. Of this the equipment spends 40 days in ice-cutting and 120 days in miscellaneous service. The total net saving per annum at the Glen Yards in a normal winter would be in excess of $4,000. However, this does not take into account the further indirect saving effected by utilizing the tie-tamping outfit at a time when it would normally be idle. This reduces the daily charge for overhead, which has its reflex on

Different views of the Glen Yards of the Canadian Pacific Railway as they appeared early in February of this year. Train movements in these yards are not delayed in the wintertime because switches and frogs are kept free of ice and snow with air-operated tie tampers.



Top—Compressor plant in the Glen Yards that houses a 10x8-inch Type 20 tie-tamper compressor. The air supplied during the cold months by this unit is piped to 33 switches throughout the yards. Bottom—Clearing a switch with a pneumatic tie tamper. For this service the tool is equipped with a saw-tooth bit.

the unit cost of tie-tamping and of other work for which the equipment is designed.

For snow removal the tie-tamper compressor has proved equally effective and economical. During snowstorms it is essential that switches be kept clear, particularly during the hours when switching traffic is heavy. For this work a 3-foot length of ¾-inch pipe is fastened to the air hose. Its free end is fitted with a plug with an inside diameter of ⅛ inch. This, however, may be made smaller if that be deemed desirable. The pipe is virtually a blow gun, and through it is forced compressed air at high velocity. It was found that one man, during heavy snow falls, could thus blow clean a switch in two minutes. Formerly, by the broom-and-shovel method, it took twenty minutes to do this. And, what is more, one man could keep from five to six switches operating or free from snow with the aid of compressed air, while with broom and shovel it was necessary, for the maintenance of service, to have one man at each switch as long as the snow continued to fall. From a time-and-money-saving viewpoint, the use of a portable compressor and tie tampers for snow and ice removal of the kind under consideration has proved both practicable and practical.

ODORLESS FUEL GASES MADE MALODOROUS FOR SAFETY

ETHYL mercaptan, an organic sulphur compound, is recommended by the United States Bureau of Mines as a detector for leaks in natural-gas and blue-water gas distribution systems. The compound is distinctly malodorous and searching, and, therefore, highly suitable for use as a warning agent for escaping odorless gases, to which class natural gas and blue-water gas belong. These, unlike certain other fuel gases, are not capable of making their presence known to the sense of smell as soon as there is a leak anywhere in the line. This is a serious deficiency, because it is the sense of smell that is generally counted upon, especially by the consumer, to give warning of escaping gas.

To insure safer distribution, the Bureau of Mines, in cooperation with the American Gas Association, has been studying this problem and has established through research that the dosing of odorless gases with very small quantities of ethyl mercaptan has the desired effect—that is, it gives them a strong smell that is noticeable the instant it is released. The addition of only 7.7 to 9.3 pounds of ethyl mercaptan per 1,000,000 cubic feet of natural gas so alters the fuel that the average house leak can be detected without delay, while the admixture of 31 to 46.5 pounds per 1,000,000 cubic feet makes it possible to trace underground leaks in mains and service lines promptly and certainly.

SMELTER SLAG USED AS BACKFILL IN COPPER MINE

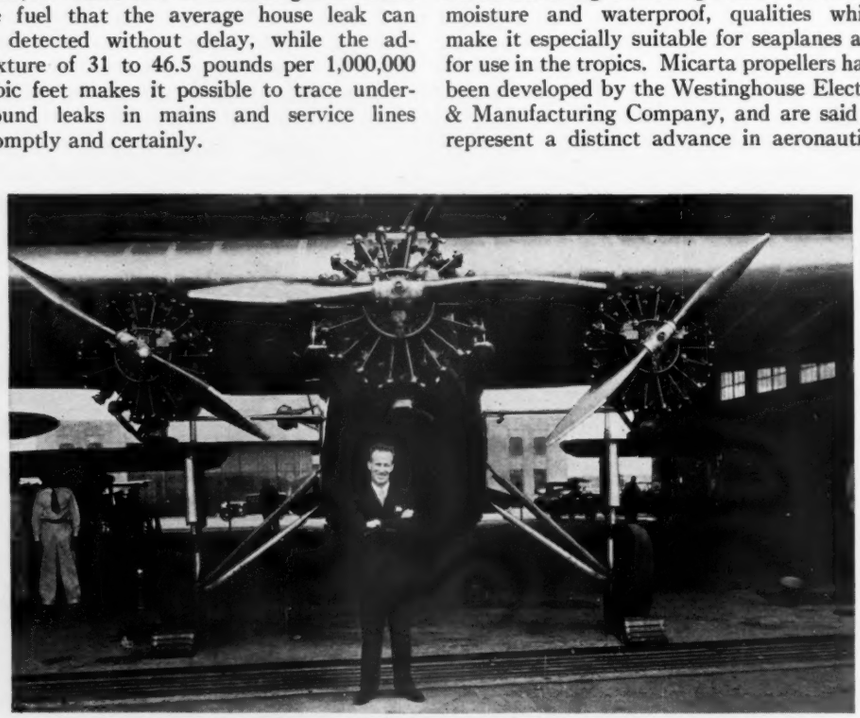
A SYSTEM whereby smelter slag can be used as backfill has been worked out by the Noranda Mines, Ltd.; and its Horne Mine is said to be the only one where material of this kind is being employed for that purpose. The effort to utilize smelter slag at the source of supply has involved considerable study; but the problems of handling it and of breaking it up so that it will pack readily would seem to have been solved.

Midway between the concentrator and the converter aisle has been placed a plant in which the slag is cast in shallow, 30x24-inch molds ribbed in 6-inch squares. When sufficiently cooled, the slag is broken up for crushing by dropping it 10 or 12 feet on to a plate. About 1,800 tons should be available at the mine daily for backfill.

COTTON BASE FOR AIRPLANE PROPELLERS

THE sturdy propellers that "pulled" the *Southern Cross* with her gallant crew across the Atlantic Ocean on that plane's recent epoch-making flight from Ireland to Newfoundland are, we are told, mostly cotton. This does not seem credible, as the mind does not ordinarily associate cotton with anything quite as durable and unyielding as airship propellers, upon which safety in flight so largely depends.

Just what is the process by which so marked a change is effected in the basic material has not been divulged—that is a secret. But the manufacturers have let it be known that layers and layers of canvas, impregnated with certain chemicals, are built up under high pressure to form a material of steel-like hardness. Micarta, as the product is called, has the added advantages of being non-corrosive and moisture and waterproof, qualities which make it especially suitable for seaplanes and for use in the tropics. Micarta propellers have been developed by the Westinghouse Electric & Manufacturing Company, and are said to represent a distinct advance in aeronautics.



Wing Commander Charles Kingsford-Smith and his famous "Southern Cross" which is equipped with micarta propellers.

Making Die Castings For Many Purposes

Radio-condenser parts, waffle irons, and automobile-distributor housings: some of the numerous things now die cast.

By A. S. TAYLOR

WHENCE come so many of the fascinating metal toys that gladden youngsters nowadays? How are these miniature locomotives, fire engines, tractors, motor vehicles, and scores of kindred creations turned out for the Christmas trade and for that general demand that exists the year round? They are the outcome of highly developed die-casting processes.

These diminutive reproductions of large-sized machines are today manufactured in great numbers and with an amazing faithfulness of detail. One has but to compare these modern toys with those of a quarter of a century ago to appreciate the astonishing improvements that have been made possible by substituting die-casting apparatus for the equipment previously in common use.

While there is a seasonal reason for reminding our readers about the manufacture of metal toys, we must not forget, however, that the same processes in their present state are utilized in the making of castings for well-nigh innumerable services. These commodities, articles, or parts are of many sorts and of endless shapes; and they range in size and form from small bits of modeled metal to decidedly intricate affairs of relatively pretentious dimensions. They may be intended to be only ornamental in their functions; on the other hand, they may be designed for strictly useful purposes; or their applications may be mechanical ones and widely diverse. In any case, they have come into being in response to a demand for commodities combining lightness with comparatively low cost of manufacture—in short, they are the result of simplified, repetitive operations that are capable of producing a very larger number of castings quickly.

Die-casting practices, as we have them today, are the climax of nearly 40 years of developmental efforts; and during that span the art has drawn upon the inventive cunning of many minds. All sorts of difficulties had to be overcome. How successful the contributive endeavors have been is proved by the way in which the demand for die castings has increased in the course of the last fifteen years. In that interval the output has been doubled every five years! This indicates both how far the art has gone forward as well as how diversified have become the directions in which die castings have been substituted for articles or parts formerly fashioned by other and more expensive means.

In foundries of the familiar sort, molten metal is poured into the tops of molds and fills the enclosed cavities by gravity flow—the procedure requiring a measurable amount of time. When sufficiently chilled, each casting is removed from the mold—necessitating the destruction of the mold and calling for the remaking of the mold before another casting can be produced. In die-casting, on the other hand, the molten metal is forced into steel molds or dies under the urge of high pressure, and the spaces within the molds are filled well-nigh instantaneously. Some die-casting dies are capable of being operated as many as 350 times in the course of an hour; and the same dies are used continuously day in and day out for possibly weeks or months. We mention these extremes in the casting of commodities so that all our readers may be able to grasp the fundamental advance represented by die-casting.

Now, without dwelling further upon the technique of this particular department of metal-working, we shall make our subject more generally understandable by describing some of the activities in the Long Island City plant, N. Y., of the Allied Die-Casting Corporation. This wide-awake organization, which has been in business about ten years, not only produces die castings of numerous kinds but it builds the machines that make those castings. The increased demand for the corporation's castings as well as for its machines caused it to construct the commodious plant which it has occupied for substantially a year. The new structure covers approxi-

In one of the two inspection departments through which all castings must pass before shipping.

mately 75,000 square feet of floor space; and the various departments are so distributed on the several floors that the flow of raw materials and products will entail the least lost motion.

We shall not deal with the building of the die-casting machines, but we can outline their principal features. This is necessary to an understanding of how die castings are turned out quickly and of the standard now so widely demanded. A die-casting machine has a carriage on which the companion parts of the die or mold are brought together and locked in position to receive the molten charge of the casting metal; and the same carriage then reverses its motion and opens the die so that the casting can be discharged. There is a furnace using city gas for fuel—at a carefully regulated pressure and feed—that heats the capacious pot in which "pigs" of the casting metal are melted; and within this pot there is a specially designed cast-iron container that engages the opening in the die. This device refills with molten metal after each operation. Then the molten metal is forced from it and into the die by means of compressed air which is admitted through a connection made at the top of this container. The air acts upon the free surface of the fluid metal and drives it forcibly and quickly into the cavities of the die. Air at a pressure of 450 pounds provides this essential impulse. The control of the various operations is by hand, but requires no exceptional skill. So much for the die-casting machine as it exists in its typically modern state. Needless to remark, these machines are the outcome of years of experimenting and very ripe experience.

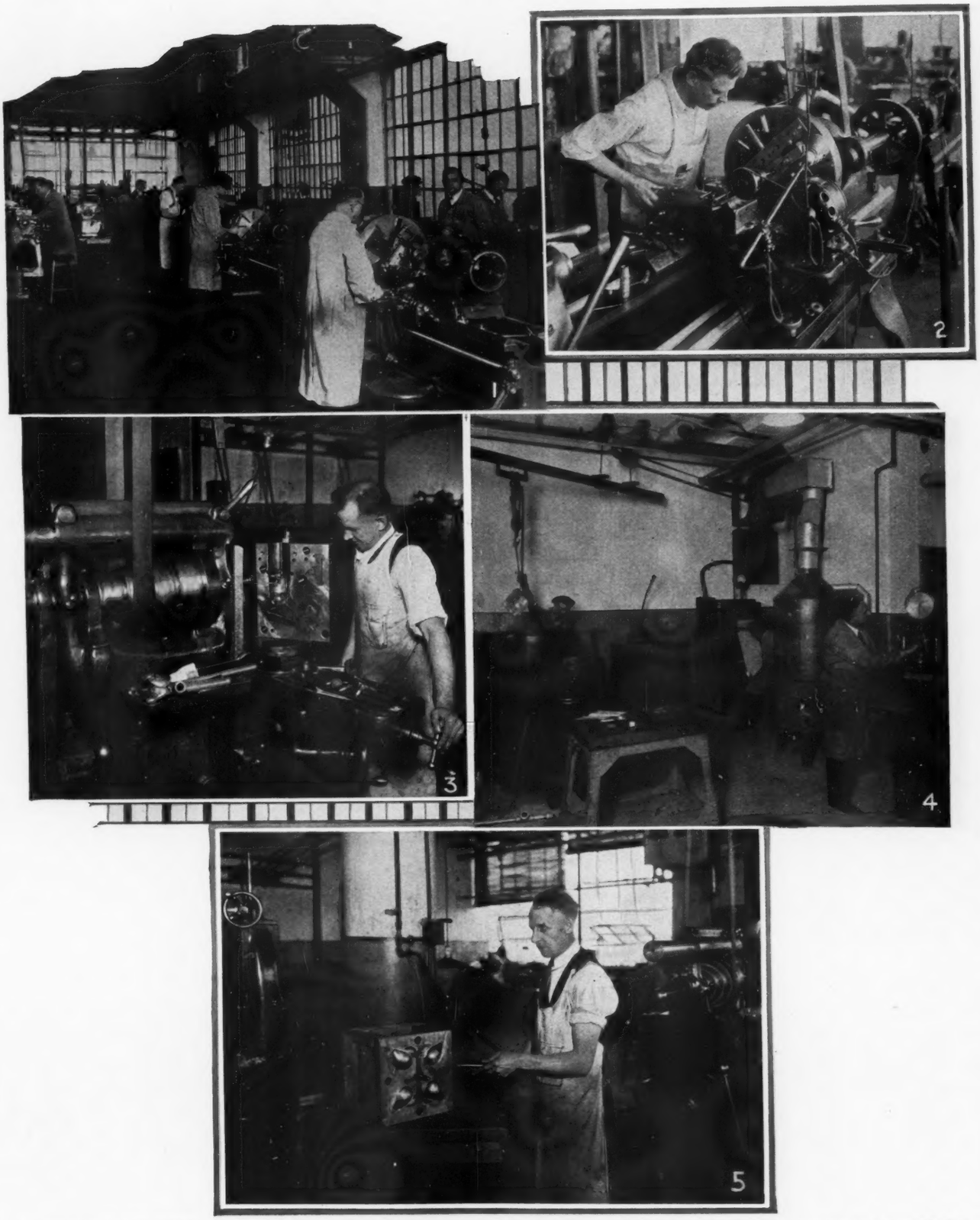
In earlier die-casting machines the practice was to employ a plunger or piston to force the molten metal into the dies. That method has numerous drawbacks which need not be dwelt upon here. The substitution of compressed air has provided a happy solution of the problem, and it also gives an operating flexibility that is extremely desirable. Manifestly, high-pressure air must be used in order to move the dead weight of the molten metal and to achieve this quickly and with sufficient force to expel dead air from the die and to fill in an instant every cavity of the mold—no matter how minute. The finish and the soundness of the casting depend upon these factors.

The question has been asked: Doesn't the use of compressed air oxidize the molten metal and cause imperfect castings? Yes, the air does oxidize some of the metal, but only to a very limited extent and where it comes in contact with the surface of the metal. This oxide remains in the container and does not enter the die. Indeed, the small quantity of oxide so formed is said to act as a protective covering on the inner walls of the container—thus preventing contact of the molten metal with those walls of the container. Machines built by the Allied Die-Casting Corporation are so designed that the metal cannot be shot into the dies before the die carriage is securely locked; and it is impossible for the operator to open the air valve unless the container is in the "shooting" position. These protective provisions are necessary.

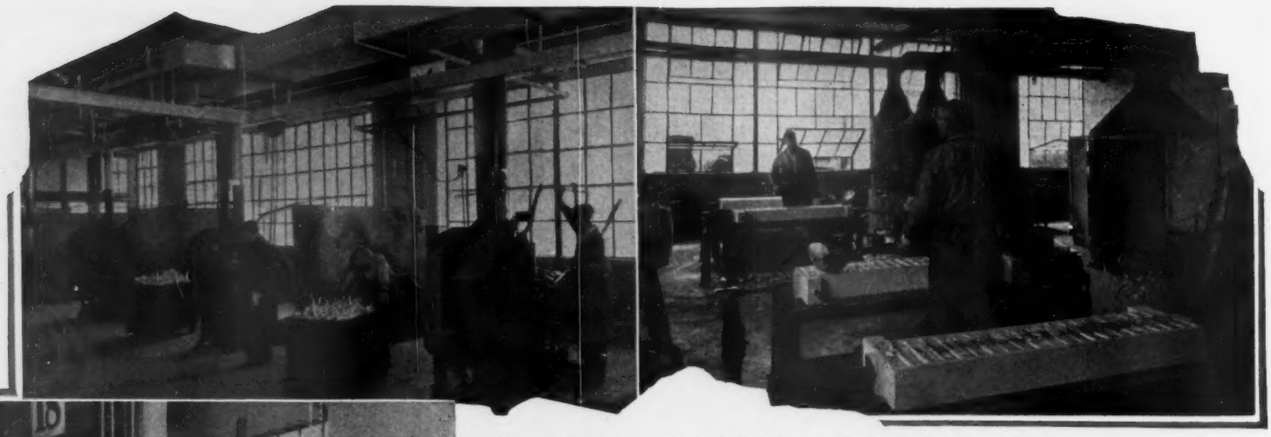
When molten metal is forced into a die by air of 450 pounds pressure a tremendous shock is delivered to the die—and this is particularly true whenever a casting has a considerable area. If the die were not held rigidly closed, the force developed would be sufficient to open it and to permit the searing metal to be scattered broadcast. In the case of a casting which has a total surface of 50 square inches—including the areas of the gate and vents, the sudden application of high-pressure air to the molten metal would exert a blow of 10 tons! It is this impulse, however, that causes the metal to impress itself against every depression in the die and thus to reproduce sharply every detail engraved in the steel. It follows, of course, that every part of a die-casting machine must be so built that it will meet very exacting requirements in the matters of strength and rigidity; and the need of this is emphasized by the number of castings made in a given period of time.

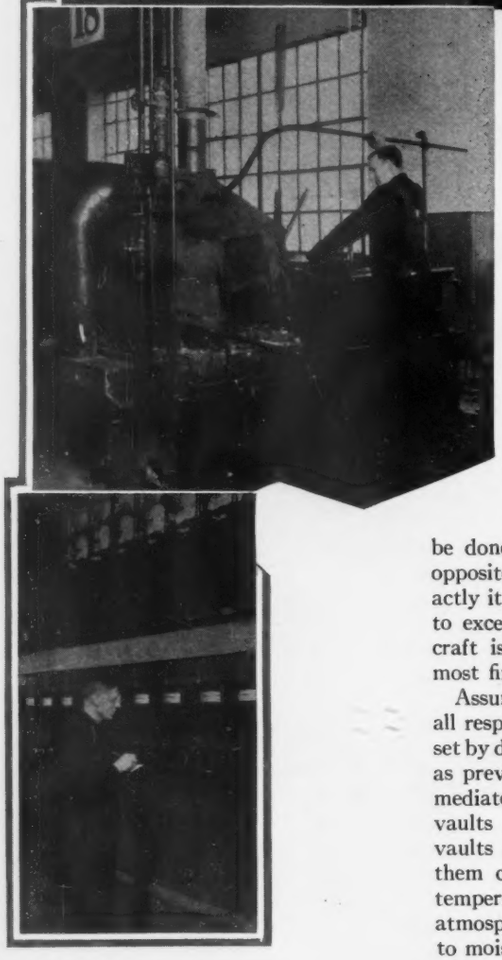
Any die-casting machine would fail to answer its purpose if the die set in it were not also equal to the service stresses to which it is put

Band saw adapted for metal-cutting proves a very useful machine in the trimming department.



1—Section of the expansive die department. 2—Milling a thread in a die so as to cast a thread on the parts to be molded in a die-casting machine. 3—An excellent example of a complex die, in the making, for the casting of electric hand-drill parts. 4—Heat-treating department where the steel dies are made finally fit for the service expected of them. 5—Compressed air is extensively used in the die department to blow away metal chips during stages of manufacture.





Top, left—One of the batteries of die-casting machines, in the Allied plant, engaged in turning out various products.
Right—A corner of the foundry in the Allied plant where all metal used in making die castings is first molded into billets or pigs.
Center—Close-up of an Allied die-casting machine, which represents ripe experience and years of developmental work.
Bottom—These electric pyrometers automatically control the flow of gas to the furnaces of the die-casting machines and so maintain a prescribed temperature.

and which are repeated from 150 to 350 times an hour. Therefore, alloy steels of special compositions are utilized in the making of the dies; and after the diesinker has finished his delicate and precise work each die undergoes a very carefully controlled heat treatment to give or to emphasize characteristics of the special steel so that that die will be able to do its part successfully.

It has been aptly said: "The die is the very heart of the die-casting process;" and, therefore, the die department is probably the most important division of the establishment. Within it something like 30 expert toolmakers and 70 equally skillful diemakers are employed in providing the means wherewith to fashion the dies and to do the work of producing the molds, so to speak, within which all sorts and kinds of articles or parts are molded.

Dies are made from solid blocks of steel; and while most dies consist of two parts there are products that call for a larger number of pieces to form a given mold. Special machinery help the craftsman to do much of the work of cutting and excavating the metal so as to model in reverse the casting that is to be turned out subsequently. Even so, much extremely fine handwork must be done with suitable tools; and where the opposite halves of the mold must meet exactly it is evident that the artisan must work to exceedingly small tolerances. His handicraft is directly comparable to that of the most finished engraver.

Assuming that the dies are acceptable in all respects—measured by the high standards set by diemakers, then the dies are heat treated as previously mentioned; and, if not for immediate service, they are stored away in vaults provided for that purpose. These vaults are so equipped that the air within them can be kept dry and at a prescribed temperature, no matter what may be the atmospheric conditions outside. If exposed to moist air and a suitable temperature, rust might quickly form on the surfaces of the steel and do irreparable damage before the action were arrested. Dies are expensive things to make, and in some cases they are very much so.

In the production of dies for die-casting machines there are many things that must be taken into account. The task is not merely to fashion dies within which can be molded articles or parts of specified shapes: there must often be a measure of give and take between the die designer and the person or concern that wishes to have commodities so made. Mr. Edgar N. Dollin, President of the Allied Die-Casting Corporation, has thus summed up the conditions: "Designing a part for die-casting so that all phases of the art may be used to advantage constitutes a problem that requires in its solving intimate knowledge of die design and machine operation as well as familiarity with the metallurgy of die castings and with trimming and cleaning methods. It also requires inventive skill." Furthermore, the designing of a satisfactory die casting also calls for a complete understanding of the uses to which the part will be put.

An exceedingly interesting development in the art of turning out die castings is the use of what are known as "inserts". These are metal parts, or of materials of some other kind, that are placed in the dies before the molten metal is forced into them; and when the metal does enter the dies it flows around these inserts and makes them a part of the castings. More often than otherwise the inserts are held in place by the surrounding metal, and it is the exception when an insert—if of metal—alloys or fuses with the metallic mass of the casting.

We are told that inserts may be made of steel, brass, wood, paper, rubber, etc., etc.; and they make it feasible to give to die castings qualities or characteristics which are different from those of the die-cast metal. Inserts enable the users of this method to reproduce designs which possibly could not be cast at low cost otherwise, and they also are a means of lessening expense in certain machining operations. Strange as it may seem, inserts of wood, paper, and rubber, for instance, are not burned when so employed. The inserts are unhurt because of the quickness with which the die-cast metal cools—an action that is hastened by the water-jacketed construction of the dies. Of this action, Mr. Dollin says: "The conditions may be likened to the act of moving one's finger rapidly through a candle's flame."

All the engineering ingenuity devoted to the devising of die-casting machines and all the skill displayed in designing dies and in producing them would count for little if the metal used in making castings were not kept at suitable temperatures. Even then the casting might either be a failure as such or unsatisfactory in service if the die-casting metal were not of the right kind. It is in this

department of the industry that the metallurgist has had a very valuable service to perform. Before we develop this part of our subject let us say that the gas-fired furnaces of the die-casting machines in the Allied plant have their temperatures automatically regulated by electrical pyrometers. Once set for given conditions, these sensitive instruments control the flow of gas to the burners; and the machine operator does not have to give the matter any heed—all he has to do is to see to it that the melting pot is continuously supplied with pigs of the right composition, which are delivered to him.

Nowadays, most die castings are made of either a zinc alloy or an aluminum alloy—that is, the base or predominating metal is either zinc or aluminum, as required. With either base, there are a number of different compositions; and each has characteristics that make it outstandingly superior for a particular application. Aluminum-alloy castings are extensively employed where conditions prescribe lightness and resistance to heat; and there are some other circumstances in which aluminum-alloy castings are preferred. Conversely, zinc-base die-casting alloys are very frequently prescribed; and alloys of this sort are now available which will make strong, sound, and permanent castings having a tensile strength ranging from 40,000 to 45,000 pounds per square inch and an initial impact strength of well over 100 foot-pounds per square inch. It is authoritatively stated that more than 50 per cent of the many millions of pounds of zinc-base die castings turned out annually are used by the automobile industry. A casual inspection of one's car will reveal some of the many ways in which castings of this sort are utilized.

If one look about understandingly, the frequency of die castings in our daily contacts would become apparent. We find them in the safety razor, in the doorknob, in the padlock, in the waffle iron, in pipe couplings, in check writers, in pencil sharpeners, in ash trays, in golf sticks, in telephone apparatus, in radio sets, and in a thousand and one things that serve us and add to our comfort, convenience, and security. Surely we are indebted to the men that have made and do make die castings possible.

HENRY LANG

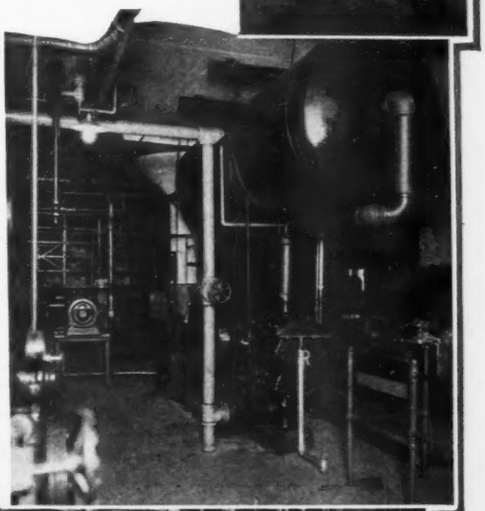
IT is with profound regret and a sense of deep personal loss that the officers of the Ingersoll-Rand Company announce the death, on November 10, of Henry Lang, for years a vice-president and a director of the company. His passing at the age of 66 is a shock to his many associates and friends.

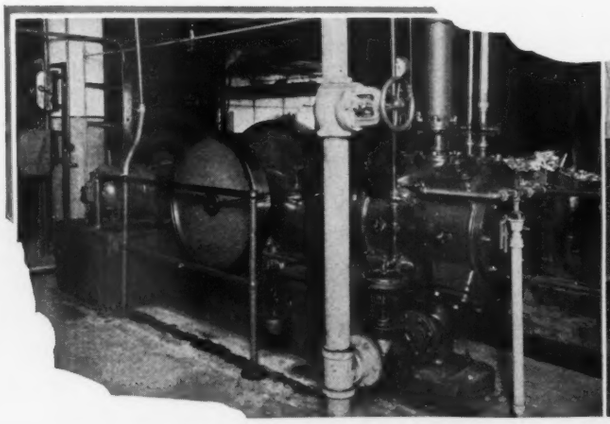
Mr. Lang was born in Martinsburg, W. Va., and was for many years a resident of Montclair, N. J., and Nantucket, Mass. His business interests were widespread; and he was conspicuous as a civic leader, sportsman, patron of the arts, and philanthropist. To know Henry Lang was to love him. He was endowed with keen perception tempered by broad sympathy; he possessed a winsomeness that ennobled deeds; and he enriched largesse with a fine love for humanity. He was reserved in manner, quiet in method, unobtrusive, and happy in disposition. He preferred to do good by stealth. It can be said of him that he stood the brunt of life manfully, and added to the common weal according to his ability and opportunities.

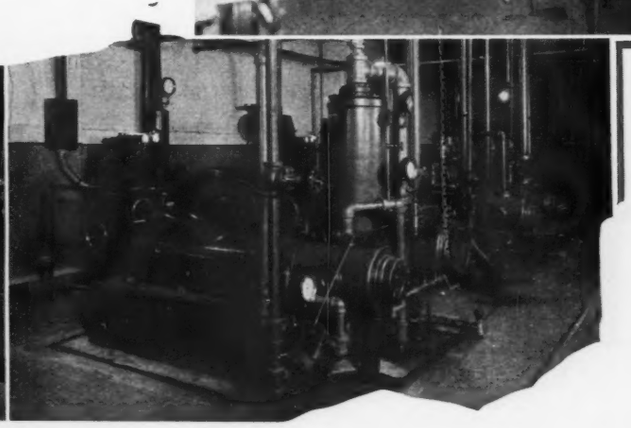
His native ability and engaging personality have been in constant service. Besides his activities with the Ingersoll-Rand Company, Mr. Lang was a director of Walter Kidde & Company and president of the Lang-Kidde Company, the Monmouth Chemical Corporation, the Rendrock Powder Company, and the Island Service Company—the latter on Nantucket, where he spent much of his time and where he had many interests.

Among the numerous clubs of which Mr. Lang was a member were the Montclair Camera Club, the Art Club of Washington, and the National Arts Club, the Salmagundi Club, the Bowling Green Club, and India House of New York City. He was one of the organizers of the Nantucket Yacht Club, and for a long time its commodore and its treasurer, in turn. Of late years ships' models had been his hobby; and his collection, obtained the world over, is said to be an outstanding one. He was also affiliated with the New York Ship Model Society, in which he took an active part.

Surviving Mr. Lang are his wife—the former Florence Rand and daughter of the late Addison C. Rand who was one of the founders of the Rand Drill Company which, in 1905, became a part of the Ingersoll-Rand Company—and his sister, Miss Anna Lang.







Top—This sturdy receiver carries operating air at a pressure of 450 pounds.

Center—An Ingersoll-Rand ER-1 compressor handles all the fuel gas supplied the die-casting machines and distributes the gas at a pressure of 10 pounds. The associated receiver is suspended above the compressor.

Bottom, left—Close-up of the 14x8-inch ER-1 compressor that takes fuel gas from the city mains and compresses it for plant service.

Right—Here are the two XOB Ingersoll-Rand compressors that provide air at a pressure of 450 pounds for the die-casting machines.

NAVY TO EXPERIMENT WITH FUEL GAS FOR DIRIGIBLES

WORK has been started by the Goodyear-Zeppelin Corporation on what will be, upon completion, the largest non-rigid dirigible in either the private or government-operated fleets in the United States. The new blimp is being built for the navy for the express purpose of making experiments with fuel gas as a substitute for gasoline. It will be remembered that the *Graf Zeppelin's* engines are gas driven, and that she was refueled during her world-encircling and her South American flights with gas produced for her in this country. The advantages of fuel gas over gasoline in airship propulsion are marked, and were recently dealt with at length in the pages of this Magazine.

The dirigible, the name of which has not been disclosed, has been laid down in the Goodyear-Zeppelin Corporation's factory in Akron, Ohio, and will be double the size of the *Defender*, now the largest blimp owned by that company and in operation in the United States. Its envelope will be 220 feet long, 54 feet in diameter, and will have a capacity of 320,800 cubic feet of lifting gas. She will be equipped with two 200-hp. engines that will give her a maximum speed estimated at 50 knots an hour.

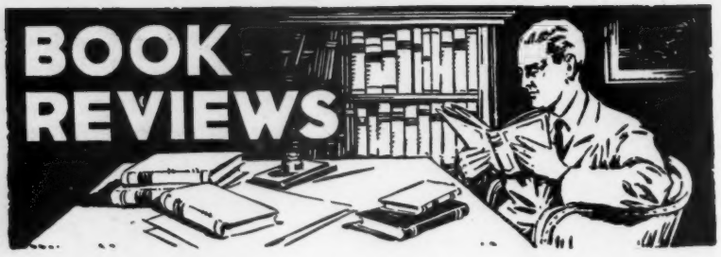
METER INDICATES MOISTURE CONTENT OF LUMBER

AN instrument that should find a ready field of application wherever lumber is worked up for one purpose or another has been designed and constructed at the United States Forest Products Laboratory at Madison, Wisc. It is an electrical meter which is capable of measuring the moisture content of wood.

According to Carlisle P. Winslow, the director of the laboratory, the "blinker", as the instrument has been nicknamed, has an indicator consisting of a pair of neon bulbs. One of these flashes at a standard rate while the other flashes at a rate determined by the moisture content of the wood being tested. If the lumber be wetter than the moisture content for which the meter is set, then the rate of the standard flash will be slower than the moisture-recording flash. The reverse is the case if the wood be drier. Contact is effected by means of needle points built into a driving hammer.

The instrument is practically instantaneous in its operation and can be used readily to sort lumber above or below a selected moisture content or to measure the exact moisture content by dialing the test flash so that it will be in time with the standard flash. Its range is about 8 to 24 per cent moisture content.

There are now more than 8,000 airplanes in use in the United States—just as many planes as there were automobiles in this country 30 years ago. There is plenty of food for thought in this statement when it is realized that 25,000,000 trucks and cars are being driven in this country today.



THE LONG HARPOON, by Arthur C. Watson. An illustrated work of 190 pages, published by George H. Reynolds, New Bedford, Mass. Price, $2.00.

THRILLING as this book is, still every instance cited is based upon data extracted from the log book of the craft in question, and is, therefore, duly recorded fact. No part of the maritime past of the United States is more colorful than the period when whaling flourished as one of the foremost of the nation's industries. Mr. Watson makes it clear to the reader why the calling exercised an impelling lure despite the hardships and the hazards associated with that particular field of sea service. In the very opening paragraph of his introduction the author shows how he has reacted to the wealth of material available to him in the files of the New Bedford Whaling Museum.

As he expresses it: "To the Yankee whaleman, the 'long harpoon' was the prince of weapons. Say what you would about the deadly lance and the skill that went into its manipulation still would the whaleman insist upon the harpoon's supremacy. None but an officer knew the tricks of lancing, it is true; none but an officer could find the 'life' of the whale, deep down in his mysterious interior; none but an officer was entitled to give that *coup de grace* and to stand proudly in the bow, ready to risk the first buffetings of the death flurry, ready to be sprayed first by the blood spoutings. Yet the chase was all but over when the lancing time came; perhaps hours had passed of line-slacking and line-hauling, of flashing flukes and gaping jaws, of swift Nantucket sleigh-rides and of foam flying with the ferocity of a snow-blizzard. And where would the officer have found his chance to stand so heroically in the bow, how could he ever have displayed the science of lancing—how could he ever have given the checkmate, in fact, if his knightly harpooner, leaping to the 'clumsy cleat' at the very opening of the chase, had not been, in the words of the old whaling classic, 'hell with the long harpoon'?

"Everything depended upon that opening moment. The boat had crept softly up to its unwitting, peaceful quarry. Nearer and nearer—sidling up to the animal to keep out of his limited vision—close to those dangerous flukes—a matter of a few feet only—'wood to black skin!' That was a moment when nerve and skill were taxed to their utmost, for it was the zero hour. The men had yet to be intoxicated and emboldened by the panic and noise of the fray. The harpoon whizzed. What if it had missed? Well, a boat's crew would have been spared a little taste of pandemonium, but the taverns might not have welcomed them upon their hom coming, and, besides, one of New Bedfor palatial mansions might never have been built

Read the whole book: it will amply repay yo

REAL WAGES IN THE UNITED STATES 1890–1926, Paul H. Douglas. A book of 682 pages, published Houghton Mifflin Company, Boston, for the Pol Foundation of Economic Research, Newton, Mass. Pri $7.50.

THE author is professor of industrial r lations in the University of Chicago an therefore, especially qualified by his dai work to deal with the subject so fully a lucidly presented in this volume. In t preface Professor Douglas tells us what w his aim and how much larger proved to the task of writing the book. Let us quot "I have attempted in this book to measu the material progress which American worke have obtained during the years from 1890 1926. Had I foreseen that in order to com plete the work it would require the maj portion of my energies for six years and th it would be necessary for me to devote to the larger part of my income for most of th time, I might not have had the courage undertake the task."

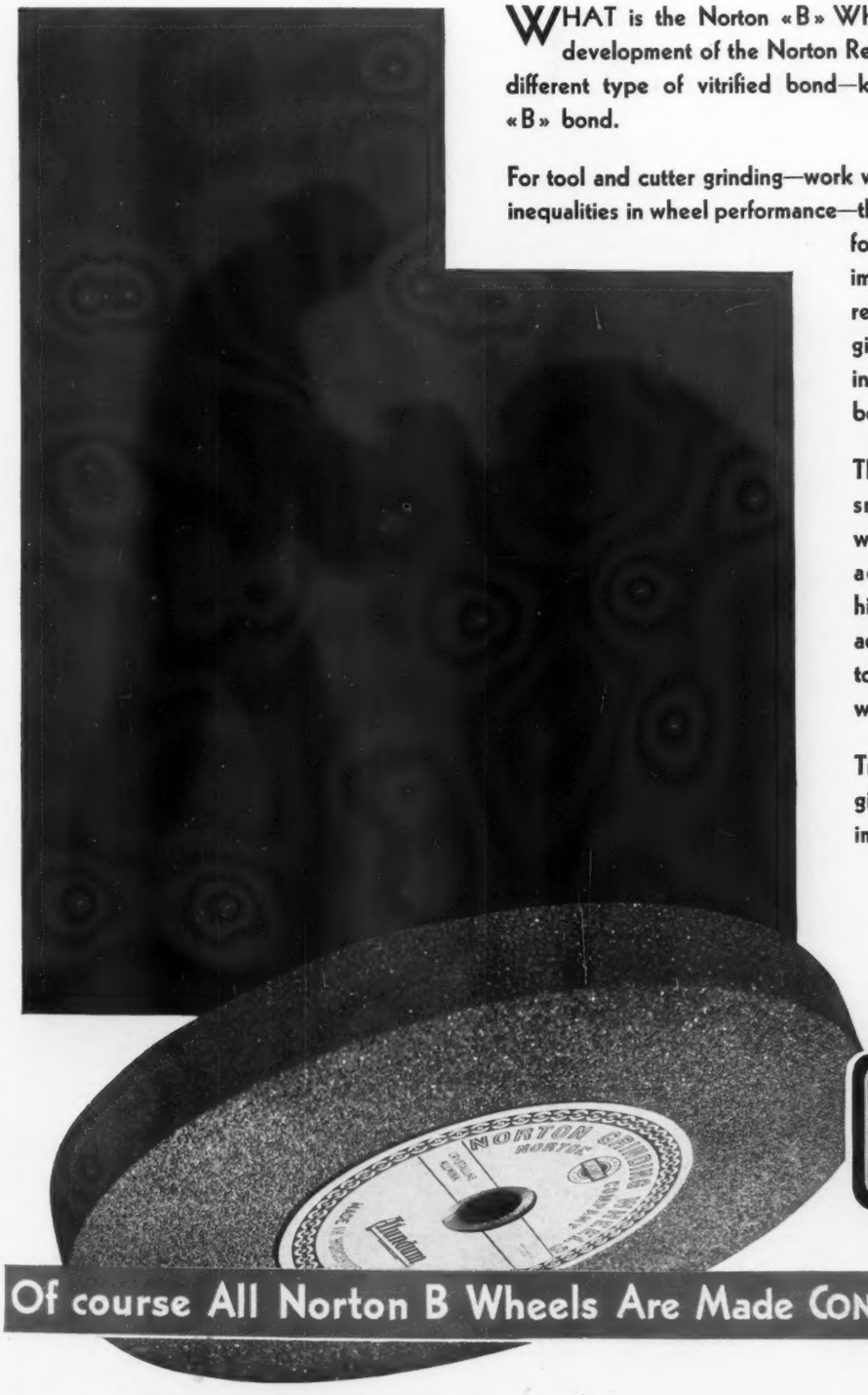
The author's first problem was to compu a new index of the cost of living, to work o new and refined series of wage-rates, to pr pare averages of the annual earnings of t employed workers, to measure the probab amount of unemployment since 1890, an then to obtain the earnings of the wag earning class as a whole. In this way on was it possible to arrive at a means of measu ing the relative purchasing power throughou the period—subdivided into hourly, weekl and annual wage-rates, so as to determi the annual earnings of the employed and t yearly income of the working class as a whol That class, by the way, numbers substantial 22,000,000 workers. The six years of lab on the part of Professor Douglas has produc a yardstick by which to gage the real value wages in their relation to both the employe and the unemployed of the great arm gainfully engaged in making a living in t United States; and his volume is a wor while contribution to the analysis of a pro lem that is very much with us.

First Annual Report on Mines and Minera issued by the Manitoba Department of Min and Natural Resources. This illustrated pu lication of 176 pages contains a great deal valuable data about the Province of Manitob Canada, heretofore not available to the ge eral public.

Overshadowing

Even its Success for Tool Grinding ~

The Norton «B» Wheel Now for Snagging



WHAT is the Norton «B» Wheel? It is a new and exclusive development of the Norton Research Laboratories—an entirely different type of vitrified bond—known for identification as the «B» bond.

For tool and cutter grinding—work which most readily discloses any inequalities in wheel performance—the «B» Wheel has made a name for itself. «B» bond brings the same improved performance, the same remarkable uniformity to the snagging field—a field where variation in wheel performance has often been accepted as unavoidable.

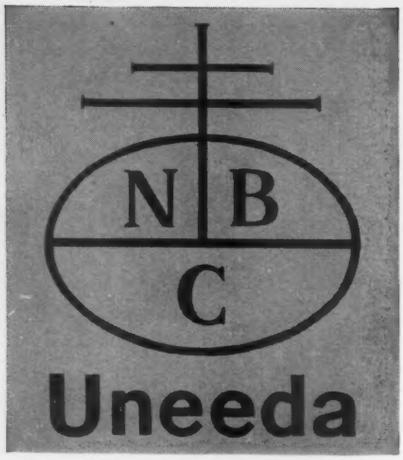
The «B» Wheel is truly a *better* snagging wheel—a snagging wheel made as precisely, as exactingly as the very fine, soft, high-precision wheel—and at no additional cost. It may be likened to an alarm clock made with fine watch precision.

Try the «B» Wheel for *your* snagging. Let it prove its worth by its improved action.

NORTON COMPANY
Worcester, Mass.

NORTON GRINDING WHEELS

Of course All Norton B Wheels Are Made CONTROLLED STRUCTURE



Another NATIONAL BISCUIT COMPANY plant installs Combustion Engineering Equipment

1917
PITTSBURGH
1919
DETROIT
1921
BUFFALO
1921
CAMBRIDGE
1923
PHILADELPHIA
1924
CHICAGO
1925
MINNEAPOLIS
1926
NEW YORK
1928
BUFFALO
1930
MARSEILLES

Type E Stokers are to be installed in the Marseilles, Ill. plant.

This makes the ninth National Biscuit Company plant to install Combustion Engineering Corporation fuel burning euqipment.

Thirteen years ago the first installation was made at the Pittsburgh plant, then Detroit, Buffalo, Cambridge, Philadelphia, Chicago, Minneapolis, New York, Buffalo and now Marseilles.

The National Biscuit Company, like many of America's leading manufacturers, has for years entrusted to this organization its problem of meeting steam demands.

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With every major development in the use of high-strength steels, Oxweld has been first to supply rods specifically designed to produce welds of tensile strength equal to, or greater than, the metal itself.

As a result, there are, today, three Oxweld rods covering the whole range of high-stress steels:

Oxweld No. 7—for years the standard soft iron rod for strengths up to 50,000 lb. per sq. in.

Oxweld No. 1 H. T.—the original high-test, self-fluxing, deoxidizing rod for strengths up to 70,000 lb. per sq. in.

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OXWELD

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SALES OFFICES IN PRINCIPAL CITIES

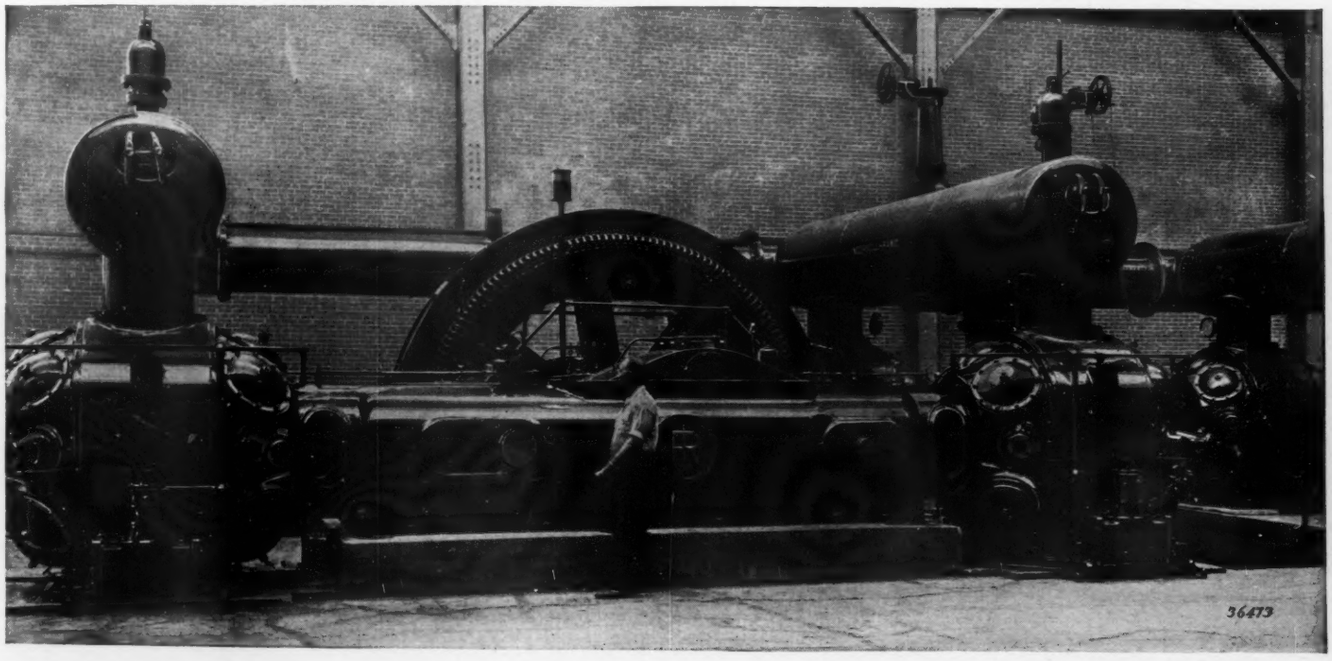
Builder of the World's Largest Compressors

is Served by the Two Largest Ingersoll-Rand Has Ever Built

THESE illustrations show the two Ingersoll-Rand Class "PRE-14-C" Compressors installed for converter blowing service at the new A. M. Byers Co. plant at Ambridge, Pa.

These units are the largest reciprocating compressors ever built by Ingersoll-Rand Company. Their design, which is entirely new, provides for a 42- by 27-inch compressing cylinder at each end of the two frames, making a total of 4 single-stage cylinders on each machine. Each unit is driven by a 2,500-horsepower synchronous motor mounted centrally between the frames. At 150 r.p.m., each compressor has a piston displacement of 25,520 cubic feet per minute. They are designed for discharge pressures of from 16 to 25 pounds. At 25 pounds, the actual delivery of each unit is 22,250 cubic feet per minute.

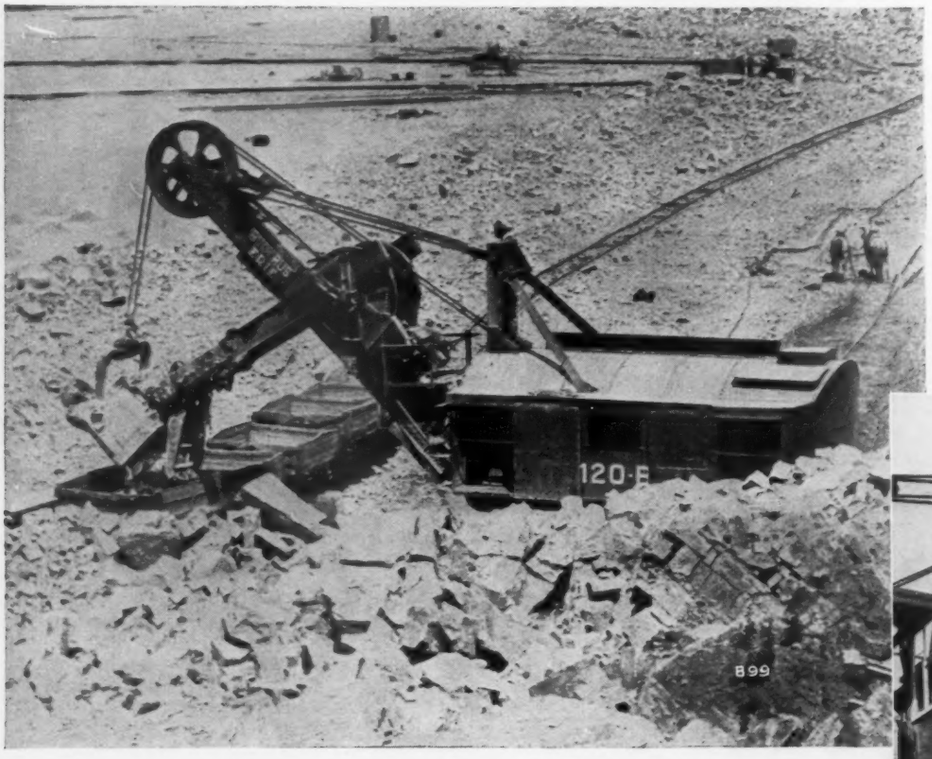
Ingersoll-Rand builds compressors for every service, in capacities from 3 cubic feet per minute and above, and arranged for every commercial type of drive. The line is the most complete in the world.



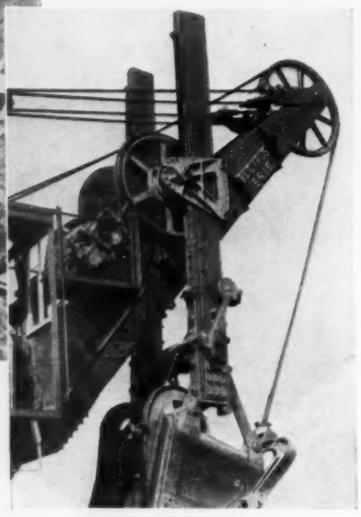
Ingersoll-Rand

1021-C

4,000,000 *Tons Young*



The 120-B's rugged front end has surplus strength with minimum weight so essential for fast swinging.



This shovel has barely begun!

Three seasons, 20 to 24 hours a day, hoisting 5-ton dipperfuls of rock into cars. Over four million tons in all — 1,270,000 tons this season alone!

How long will this big quarry shovel stand this pace? Too early to estimate yet. Ten years will make possible a safer guess. For this company has the king of quarry shovels, a Bucyrus-Erie 4-yard 120-B electric.

It's their second 120-B, for the company already had one in another quarry. Hence, unfailing output of big daily tonnage was an old story to them, and they bought this shovel knowing that no other 4-yard machine could approach it in reliability and economy of operation.

Today, with 4,000,000 tons "under its belt," this shovel's record of big output, unfailing steadiness, and low operating and repair costs has wiped out any doubt about what's what in 4-yard quarry shovels.

Check up on *your* rock loading. Maybe you need a 120-B, or a 3, 2, or 2½-yard of similar design. Let us tell you about these superior shovels.

Representatives throughout the U. S. A. Offices or distributors in all principal countries. *Branch Offices:* Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco.

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BUCYRUS-ERIE COMPANY, manufacturers of the only complete line —all sizes, types and powers. *Plants:* South Milwaukee, Wis.; Erie, Pa.; Evansville, Ind. *General Offices:* South Milwaukee, Wis.

FOR BLASTS LIKE THIS----
USE HERCULES EXPLOSIVES

The photograph above is of a successful blast in a large Pennsylvania limestone quarry where Hercules explosives brought down 60,000 tons of rock.

The explosives for this blast were carefully selected to give the best results in this particular quarry, yet the same charge might not have been so satisfactory in another quarry. But — there isn't a quarry, regardless of size or the problems involved, where properly selected Hercules explosives won't meet the blasting needs effectively and economically.

It pays to use correct explosives. To help make selection easier, we have printed at the right the comprehensive list of Hercules explosives which are designed to meet your every blasting requirement. Hercules service men are always glad to advise in connection with proper selection and use of these explosives. Check the coupon-list for further information.

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NORRISTOWN, PA.
PITTSBURG, KAN.
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THE EXPLOSIVE FOR YOUR WORK IS IN THIS LIST

☐ **HERCULES GELATIN EXTRA L. F.**—Dense and strong · plastic and water-resisting · first in fumes · the leading gelatin-type, all-purpose explosive · strengths: 30% to 90% · 190 cartridges.*

☐ **HERCULES GELATIN L. F.**—Dense and strong · plastic and water-resisting · needed only under severest conditions · first in fumes · strengths: 20% to 90% · 184 cartridges.*

☐ **GELAMITES 1 and 2**—Semi-plastic · water-resisting · bulkier than the gelatins · often replace gelatins up to, and including 60% strength at a saving in cost · No. 1 - 220, and No. 2 - 240 cartridges.*

☐ **HERCULES STRAIGHT NITROGLYCERIN L. F.**—Strong · fast · water-resisting in higher strengths · strengths: 15% to 60% · 208 cartridges.*

☐ **HERCULES EXTRA L. F.**—For general blasting · strengths: 20% to 60% · 220 cartridges.*

☐ **HERCOMITES 2 to 7**—General purpose explosives · very economical where suitable · 240 cartridges* for No. 2, to 350 for No. 7 · also Hercomite Bag packed in 12½ lb. bags.

☐ **HERCULES TORPEDO GELATIN**—Replaces liquid nitroglycerin for shooting oil, gas, and water wells · strength: 80% · 196 cartridges.*

☐ **HERCULES BLASTING GELATIN**—Water-resisting and powerful · valuable for submarine blasting, shooting gas or oil wells · 100% strength · 200 cartridges.*

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☐ **HERCULES BLASTING POWDERS**—"A": 8 granulations (coarse to fine) and dust—"B": 7 granulations and Herco—Herco: used in well-drill holes with Cordeau - Bickford detonating fuse—all powders packed in 25 lb. kegs.

☐ **HERCULES BLASTING SUPPLIES**—A complete series of detonators and blasting accessories.

***NOTE: Cartridge counts refer to the approximate number of 1¼" by 8" cartridges in 100 lbs. of the explosive.**

HERCULES POWDER COMPANY
King Street, Wilmington, Delaware

Gentlemen: Please send me pamphlets describing the explosives checked.

Name.....

Company.....

Street.....

P. O......

D-3

At 50° Below Zero

Drilling with an X-59 "Jackhamer" while the thermometer registers 50° below zero. R-2131

The Flin Flon, Manitoba's first big metal mine, is now producing from both the open pit and the underground workings. The open pit work is being carried on in what was once the bottom of Flin Flon Lake.

The property is located at 54° latitude north, and on the day this photo was taken, the thermometer registered 50° F. below zero. Note the "Parka," with its hood, heavy mittens, shoes, etc., which the "Jackhamer" operator is wearing as a protection against the severe weather.

Working successfully at 50° below is *Something.*

Or 97° Above

Operating I-R Drills in South Africa. The temperature of the rock is 97° F.

In contrast to conditions at the Flin Flon Mine, we illustrate our drifter drills on the 38th level of the Village Deep Mine in the Witwatersrand district of South Africa. This is the deepest mine in the world—7,600 ft.; and the temperature of the rock is 97° F. To cool the atmosphere and make working conditions more satisfactory for the men, it is necessary to send four tons of ice to the bottom of the mine each 24 hours.

There is a difference of 147° between the two jobs, yet *Standard I-R Drills* meet both jobs successfully.

INGERSOLL-RAND COMPANY
11 Broadway • New York City
Branches or distributors in principal cities the world over
For Canada refer: Canadian Ingersoll-Rand Co., Ltd.
10 Phillips Square, Montreal, Quebec
For Europe refer: Ingersoll-Rand Co., Ltd.,
165 Queen Victoria St., London, E. C. 4.
68-RDM

Ingersoll-Rand

Would you fire a man

for putting Sand in your Lubricating Oil?

Of course, you'd fire him. Yet you're paralleling his action if you operate your pneumatic machinery without Protectomotor Air Filters.

For you are permitting the blasting power of compressed air to drive billions upon billions of sharp, gritty dust particles in the air into the oil and moving parts of machines to create carbon and cut moving parts.

When dust gets into oil it bakes hard and forms carbon. The Protectomotor reduces carbon deposits 60 to 70% because barely one particle of dust in a thousand gets through this filter.

Dust and dirt grind and score cylinder walls, pistons, bearings and valves, necessitating frequent regrinding and replacing of valves and reboring the cylinders, which can be prevented by installing Protectomotor Air Filters.

Protectomotor equipped machines operate from 3 to 5 times longer before overhauling is necessary as this filter reduces wear from 75 to 85%.

The Protectomotor may cost a little more than ordinary air cleaners, but is worth many times the price when you consider that most air cleaners permit 300 times *more* dirt to pass.

The Protectomotor is a dry filter. It requires no oil, cleaning tanks or spare parts, and does not have to be adjusted. Its efficiency is not reduced by collected dust. Under ordinary conditions the felt filter requires cleaning only once or twice a year.

Another thing, the Protectomotor prevents loss of compressed air due to valves sticking, and it silences noise from the intake and exhaust.

Write for our Catalog.

Staynew Filter Corp.
7 Leighton Ave., Rochester, N. Y.

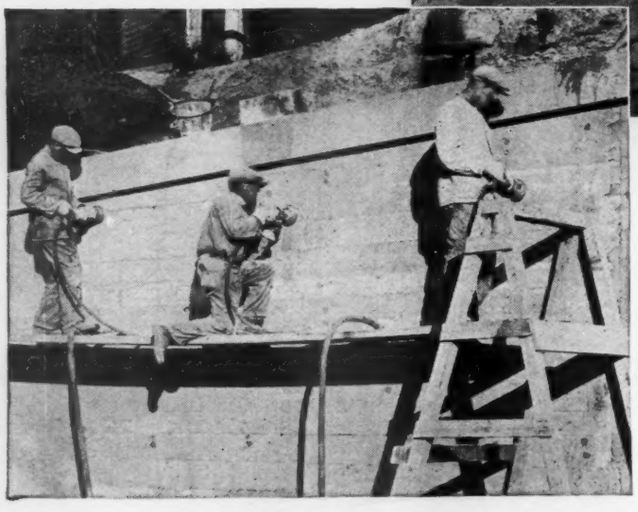
PROTECTOMOTOR
REG. U.S. PAT. OFF.
99 9/10 Per Cent EFFICIENT
AIR FILTERS

Great Savings effected

Cover outwears steel armoring — oil resistance of inner lining is two to five times as great as ordinary rubber

REPAIRING BRIDGE (above) on Military Road near Buffalo with chipping hammer. Where tools are frequently moved, resistance to kinking, typical of Goodrich Air Hose, is an important factor.

"JACKHAMERS" (above) and Keystone driller on New Street, Fort Lee, New Jersey. This service, hard on equipment, is easily withstood by the extra tough covering of Goodrich Air Hose.

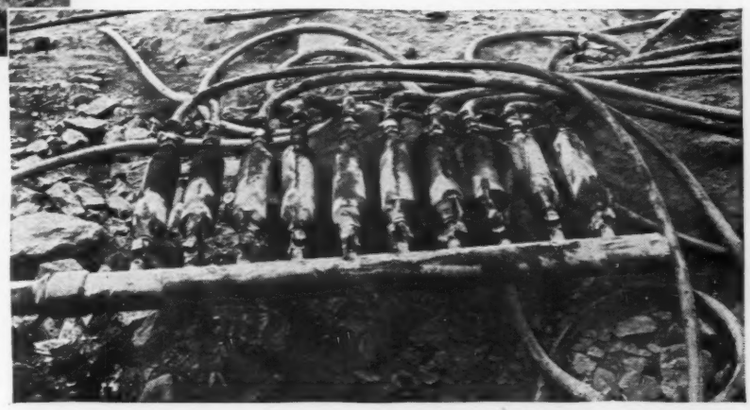


THREE GRINDERS (left) on concrete surfacing job at Dorchester, Mass. The lightness and flexibility of Goodrich Air Hose and its resistance to kinking enable this work to be done at high speed.

by this special air hose

SEVEN CALKING GANGS (left) at work on gas main. Each gang uses two Little David Calking Hammers. Here is where the unusual kink-resistance of Goodrich Air Hose keeps work moving smoothly.

PNEUMATIC TAMPING (above) on Erie Railroad. Resistance to wear saves money on such jobs. Special cover of Goodrich Air Hose outwears ordinary rubber twice its thickness, and even outwears steel armoring.



TEN TYPE D AIR LINE LUBRICATORS (right). One of several similar installations on the Di Marco and Reimann contract of the New York Subway. Where tools are lubricated through the hose, Goodrich Air Hose shows remarkable savings in replacement costs. Tests have proved that the special rubber compound used for the inside tube of Goodrich Air Hose resists the rotting effect of lubricating oil up to 200° F., from two to five times longer than ordinary rubber.

Goodrich Air Hose

Another B. F. Goodrich Product

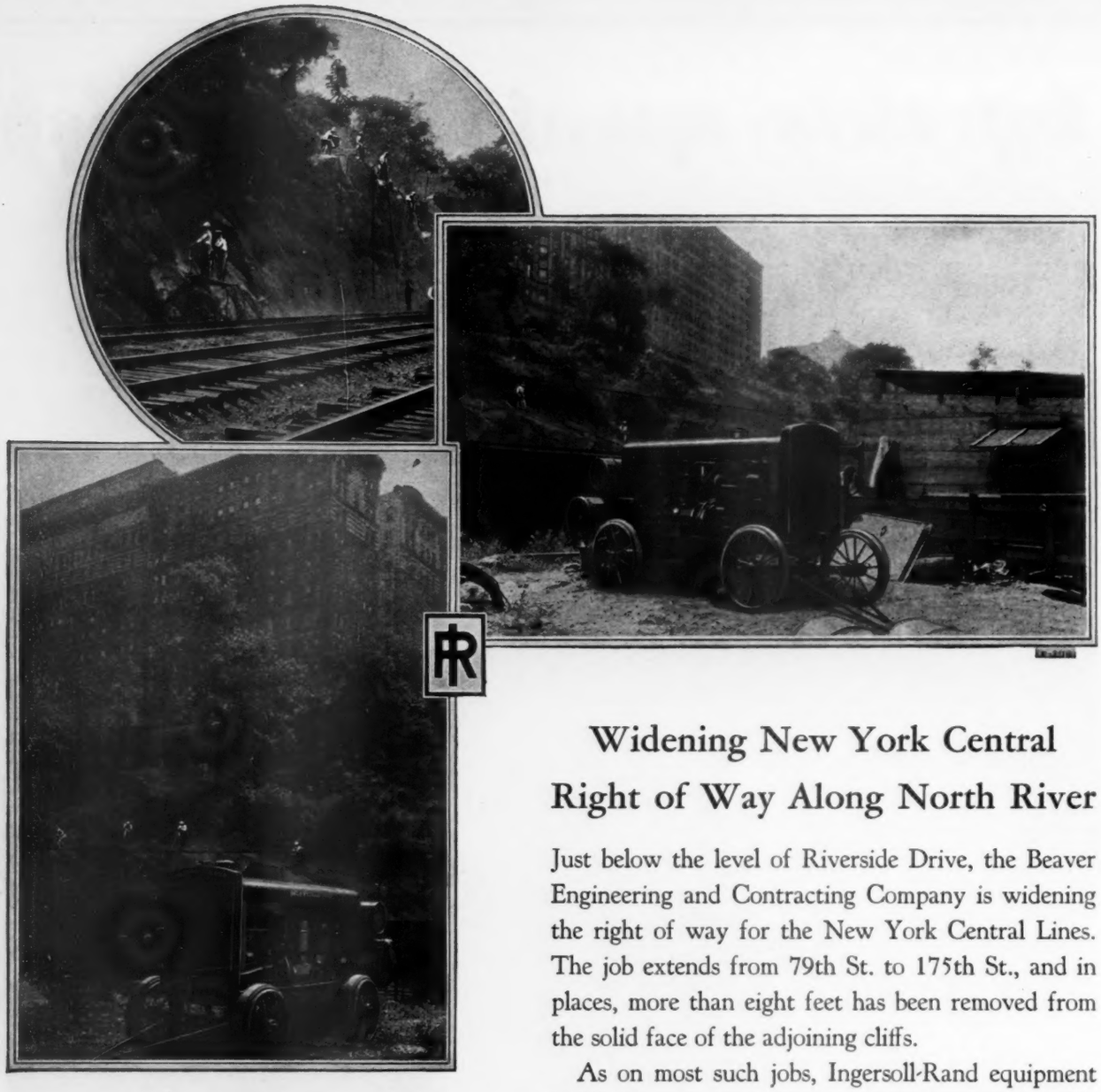
The B. F. Goodrich Rubber Company, Akron, O. (In the West, address Pacific Goodrich Rubber Co., Los Angeles, Calif.)

Gentlemen: Please send me catalogue 3485 on Type 50 Air Hose.

Name_____

Address_____

City_____ State_____



I-R 10"x8" portable compressor on the west side of the tracks, 86th St. and North River. A few of the drillers are to be seen in the background.

Above, right: 7"x6" compressor, with blacksmith shop at the right.

Circle: Six drillers working on the east side of the tracks.

Widening New York Central Right of Way Along North River

Just below the level of Riverside Drive, the Beaver Engineering and Contracting Company is widening the right of way for the New York Central Lines. The job extends from 79th St. to 175th St., and in places, more than eight feet has been removed from the solid face of the adjoining cliffs.

As on most such jobs, Ingersoll-Rand equipment is included in the contractor's outfit. Amongst the I-R units in almost daily service are ten portable air compressors, a number of "Jackhamer" rock drills, and a complete line of blacksmith accessories.

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266-PC

Ingersoll-Rand

Western drop door dump cars at the Flin Flon operations of the Hudson Bay Mining and Smelting Co., Ltd.

The Toughest Job in North America is Handled by Western Dump Cars

The Flin Flon open pit copper mine of the Hudson Bay Mining and Smelting Co., Ltd., is the toughest job in North America.

Stripping is tough—the overburden is filled with tough boulders.

Mining is tough—the ore weighs 2½ tons to the yard, broken out of a narrow deep pit.

Dump cars had to be "tough"—the toughest job in North America called for the best dump cars in North America and Western Drop Door Air Dumps were installed.

The record of these dump cars for long service without important repairs is remarkable. Enthusiastic comment has followed their use everywhere.

The nearest job that even approaches Flin Flon in toughness is at the Chino Mines of the Nevada Consolidaded Copper Co., which recently gave a third order for Drop Door Westerns.

May we tell you why practically every installation of these superb cars has been followed by repeat orders? Be sure to get our Dump Car Catalog No. 81-F. Better write now while you are thinking about it.

Western Wheeled Scraper Company
Aurora, Illinois, U. S. A.

WESTERN

If you want to turn out more work put the G·T·M· on the job

The G.T.M. — Goodyear Technical Man — helps turn out more finished jobs. And at lower cost. He studies all work conditions. He spots reasons for delay or expense. He applies a sound remedy. Whether it is movement of goods, engine-power, air, or liquids, by accurate specification of Mechanical Rubber Goods to need he insures an efficient operation. His wide experience helps you to smoother, faster production and profit.

From compressor to business-end of an air line are G.T.M.-specified economies. He knows this industry as few other men. For compressor drives he has remarkably reduced costs with the Goodyear Compass Endless (Cord) Belt—*a nearly stretchless belt with a core of cord.* He has supplied thousands of feet of Goodyear Air Hose to conduct air efficiently to tools and pneumatic equipment. His Goodyear Packing everywhere protects compressing power. The G.T.M. knows your work and your problems. He can bring new profits to you now.

For the help the G.T.M. can be on your job, just write to Goodyear, Akron, Ohio, or Los Angeles, California.

THE GREATEST NAME IN RUBBER

GOODYEAR

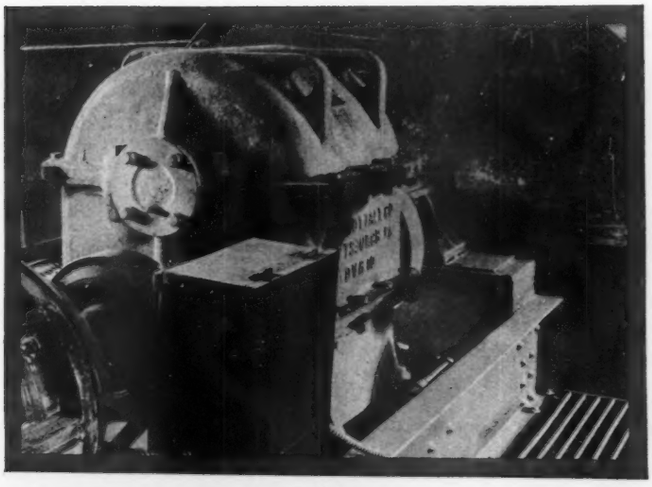
BELTS MOLDED GOODS HOSE PACKING

Driving down HANDLING Costs

...with Speed Reducers

THE economies effected by the use of Westinghouse-Nuttall speed reducers with materials handling machinery are of vital interest to every industrial and mining company using conveyors, elevators, etc.

More efficient, high-speed motors can be used. Installation is easier and less expensive. Power efficiency is increased. There is practically no upkeep expense, as the dirt-proof case insures ideal operating conditions for the totally-enclosed gears and bearings. More dependable performance cuts costly production interruptions. Safer and quieter working conditions are provided and more space is available for other purposes.



Head pulley on elevator conveyor driven by 15-hp., 900-rpm. motor and Westinghouse-Nuttall double-reduction speed reducer having a ratio of 30.3 to 1.

Correctly designed, accurately and sturdily built, Westinghouse-Nuttall speed reducers extend these savings over many years, not only on handling equipment, but with practically any production machinery where efficient operation at less than motor speed is desired.

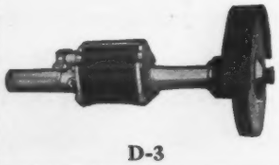
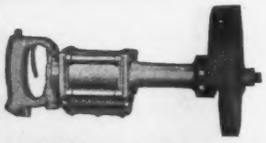
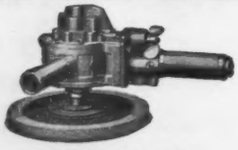
Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T 31197

ROTOR AIR GRINDERS

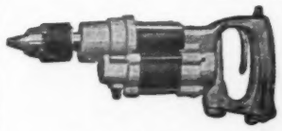
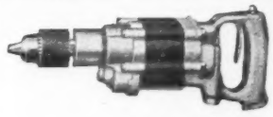
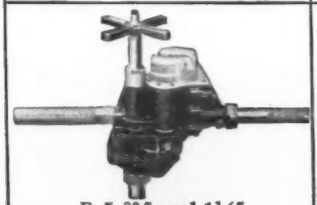
Straight or Spade Handle

Type	Wheel or Brush (Inches)	Free RPM	Full Load RPM	Weight (Pounds)	*The Work It Will Do*
 Die Grinder	1½″ Vitrified 2½″ High Speed	18000 to 20000	13000 to 15000	4	A light, very powerful tool for small grinding wheels, used on dies, metal patterns and similar work.
 D-O Grinder Standard and High Production	4″ Vitrified 4″ H S	6000 8000	5500 7200	7 7	For grinding with 4″ wheel, where speed of 6000 or 8000 r.p.m. is wanted. Especially useful for using up stub wheels.
 D-1	6 x 1 x ⅝ or 6″ Brush	4300	4000	9¼	For general grinding, wire brushing, and buffing with 6″ wheels, where a working speed of 4000 r.p.m. is desired.
 D-1 High Production	6 x 1 x ⅝ or 6″ Brush	6000	5700	9¼	A High Production Model for 6 x 1″ wheels of the high speed type, operating at 5700 r.p.m.
D-1, 13″ Extension  D-1, 26″ Extension	6 x 1 x ½  4 x 1 x ½	4300 10000	4000 6000	11 16	For grinding inner surface of hollow castings which would otherwise be inaccessible. Uses cone wheel, plain wheel or cupped wheel of small diameter. Straight handle only.
 D-3	8 x 1 x ⅝ or 8″ Brush	3200	3000	16	For general grinding, wire brushing and buffing with 8″ wheels where working speed of 3,000 r.p.m. is desired.
 D-3 High Production	8 x 1 x ⅝ or 8″ Brush	4500	4300	16	For use with 8 x 1″ High Speed Rubber, Bakelite and Elastic Bonded Wheels, operating at 4300 r.p.m.
 Rotor Sander	9″ Pad or Wire Cup Brush	3600	3300	10½	For use with sanding pads where extremely smooth finish is desired, and with wire cup brushes.
 High Production Vertical Grinder	6 x 1½ x ⅝ Cup Wheel	4700	4400	10½	A vertical machine used with cup wheels for grinding flat surfaces and welds.

The Rotor Air Tool Co. • 5704 Carnegie Avenue • Cleveland, Ohio

ROTOR AIR DRILLS

Non-Reversible and Reversible

Type	Reversible or Non-Reversible	Capacity (Inches) Drill	Capacity (Inches) Ream	Free RPM	Full Load RPM	Weight with Chuck (Lbs.)	Length Overall (Inches)	*The Work It Will Do*
 E-0	N. R.	1/4		2000	1300	4	10	A light, powerful drill for small drilling of any sort, such as tell tale holes, lead holes, etc.
		5/16		1500	975			
		3/8	1/4	1000	650			
 E-1 and E-2	N. R.	3/8		1200	850	7 1/2	12 1/2	Useful for general machine assembly work, they are ruggedly built to withstand hard usage.
		1/2		1000	750	8 1/2	13 1/2	
 E-1C and E-2C	N. R.	3/8	5/16	750	650	8 1/4	13 1/2	Compound geared for great torque, these drills are light and simple in construction.
		1/2	3/8	500	440			
		1/2		750	650			
		5/8	3/8	500	440	8 3/4	14 1/2	
		3/4	7/16	375	325			
 E-1C and E-2C	N. R.	3/8	5/16	750	650	10 1/4	13 1/2	These drills can be equipped with any combination of side handles, feed screw, Morse taper socket or chuck. The Rotor governor controls the speed and air consumption.
		1/2	3/8	500	440			
		1/2		750	650			
		5/8	3/8	500	440	10 3/4	14 1/2	
		3/4	7/16	375	325			
 E-4C and E-40C	REV. or N. R.	1/2		780	650	16	19	For drilling, reaming, nut-setting and woodboring these tools can be furnished with any desired equipment. They are light, powerful, compact and vibrationless in operation.
		3/4	7/16	400	350			
		3/4	11/16	570	375			
		7/8	9/16	290	250	17	20	
		1	9/16	175	135			
 E-5 $\frac{13}{16}$" and 1 1/4"	REV. or N. R.	7/8	9/16	350	225	22	13 1/2	A powerful, heavy duty drill, weighing only 22 lbs., with compound gears, well balanced and with heavy construction. Furnished with feed screw, or spade handle and suspension ring.
		1	9/16	220	160			
Screw Drivers  E-1C and E-2C	N. R.	No. 16 Screws		375		7 3/4	12 1/2	A positive drive, dog type clutch with quick change chuck make these tools especially effective for wood or metal screwdriving.
		No. 20 Screws		375		9 1/2	13 1/2	

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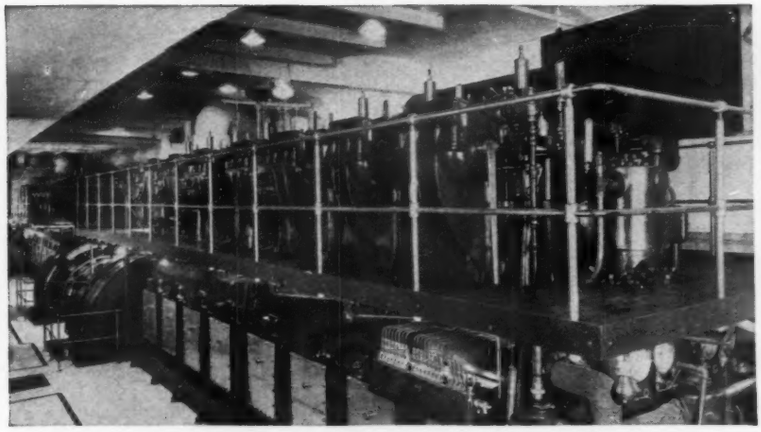
MACY'S

Uses 1,000,000 *Cubic Feet of* CLEAN AIR *A Minute*



Two large Diesel engines at Macy's Department Store, New York City, protected by Six Type-SCF Unit Air Filters

AMERICAN AIR FILTERS

COMBINING THE PRODUCTS FORMERLY MANUFACTURED UNDER THE FOLLOWING TRADEMARKS:

MIDWEST TRADE MARK

Reed Air TRADE MARK filters ALL METAL

NATIONAL AIR FILTERS NATIONAL TRADE MARK

Macy's of New York, one of the largest department stores in the world, uses in its ventilation 1,000,000 cubic feet of air a minute, cleaned by one of the world's largest air filter installations, consisting of nineteen automatic American Air Filters.

It is natural that the same filters selected to provide clean air for this great building and to protect its valuable stocks should also be selected to provide clean air for its two giant Diesels.

The filtration of intake air is recommended by every prominent manufacturer of Diesel engines and compressors. Filtering removes dust, which ordinarily settles on oil-coated cylinders, pistons and valves, hardening into abrasives that score cylinders and bearings, causing valves to stick and necessitating excessive cleaning, replacement and labor costs.

Tests show that the cost of repairs and supplies for engines and compressors equipped with air filters is 40% to 60% less than for those not so equipped. For information, send the coupon. No obligation.

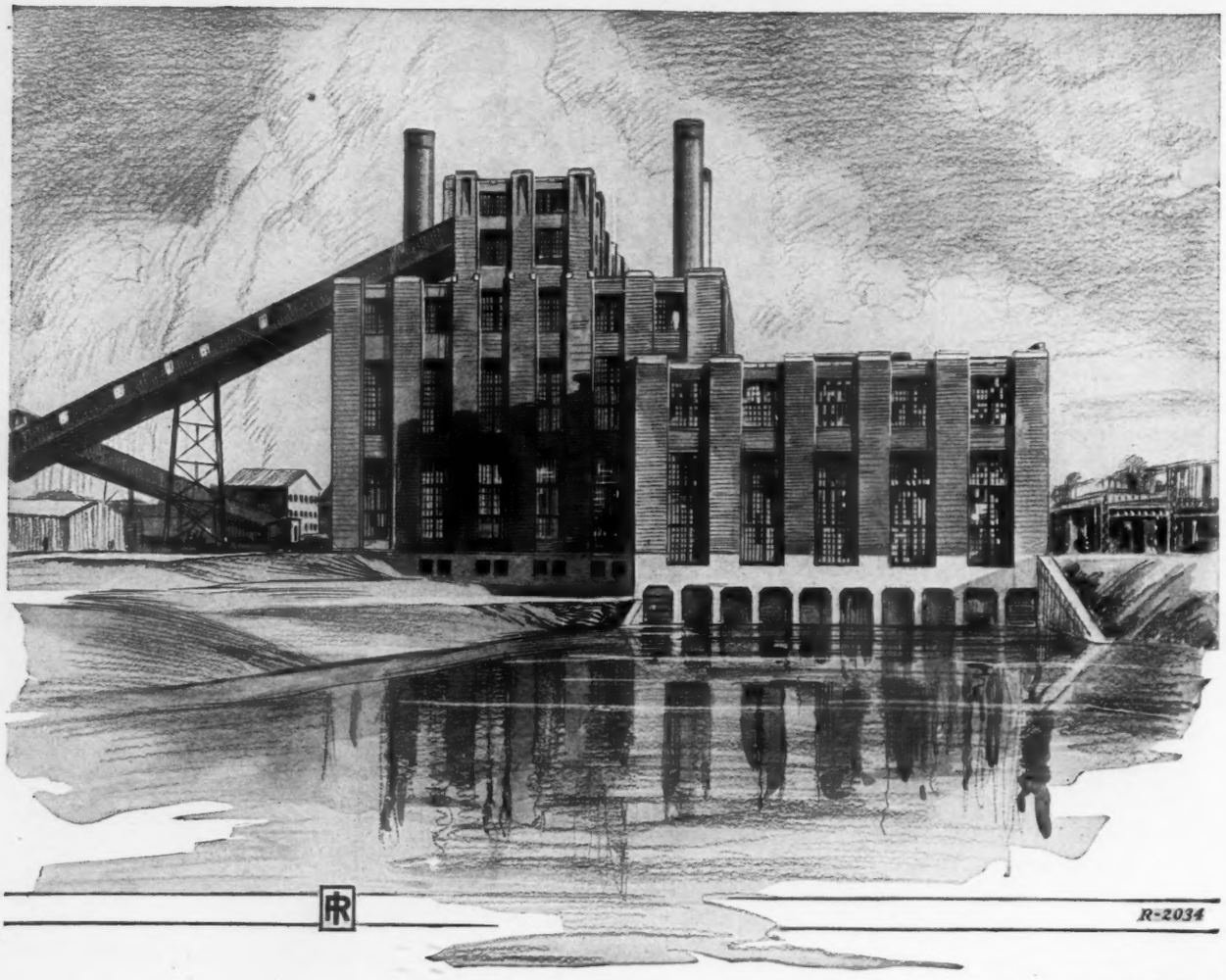
American Air Filter Co., *Incorporated*, Louisville, Ky.

AMERICAN AIR FILTER CO., *Incorporated*, 114 Central Ave., Louisville, Ky.
Please send free bulletin on the use of modern air filters for engines and compressors. For general ventilation. ☐ (Check if wanted.)

Name_____

Street_____

Address_____ **State**_____



The Riverbend Steam Station of the Duke Power Company was designed and built by the Engineering and Construction Departments of the Duke Power Company under the direction of W. S. Lee, chief engineer and vice-president. This station uses Cameron Pumps and Ingersoll-Rand Air Compressors.

another

Central Station with Ingersoll-Rand and Cameron Equipment

The Duke Power Company's system serves approximately 250 communities in North and South Carolina having a population of about 3,000,000.

The Riverbend Steam Station with its initial installation of 137,500 kva. brings the total capacity of the system to over 1,000,000 kva. It increases steam station capacity to a point where it is equal to over 50 per cent of the installed capacity of the water power stations and assures continuity of the power supply even during extreme periods of drought.

The ultimate capacity of the station is 450,000 kva.

Ingersoll-Rand and Cameron Equipment for the Central Stations:

Surface Condensers
Boiler-Feed Pumps
Circulating Pumps
Condensate Pumps
Service Pumps
Vacuum Pumps
Pneumatic Tools
Paving Breakers
Air Compressors

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Ingersoll-Rand

A. S. Cameron Steam Pump Works

390-DV

The DriAir Separator

will remove water from your compressed air lines

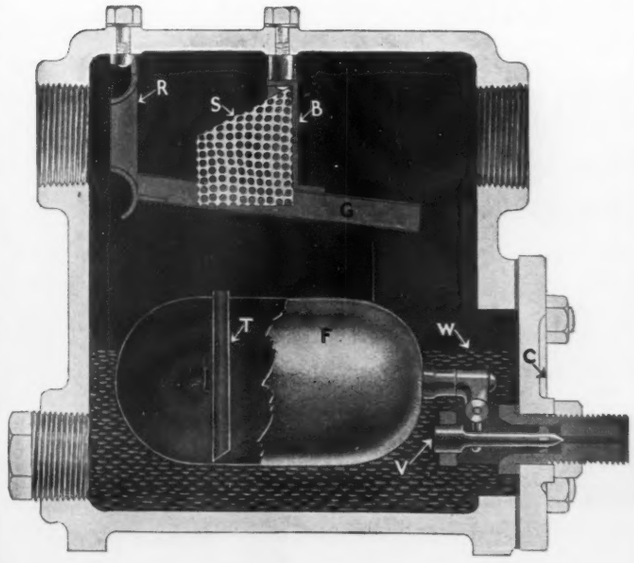
automatically

Water carries dirt, rust and scale from pipes to tools, washes out lubricating oil, freezes in the exhaust, causes delay and reduces production.

The DriAir delivers clean dry air which speeds production, stops freezing, and rusting, and eliminates "blowing-out" and hand operation of drip cocks. DriAir saves its cost in lower maintenance and longer life of tools and other pneumatic equipment.

New Jersey Meter Co.

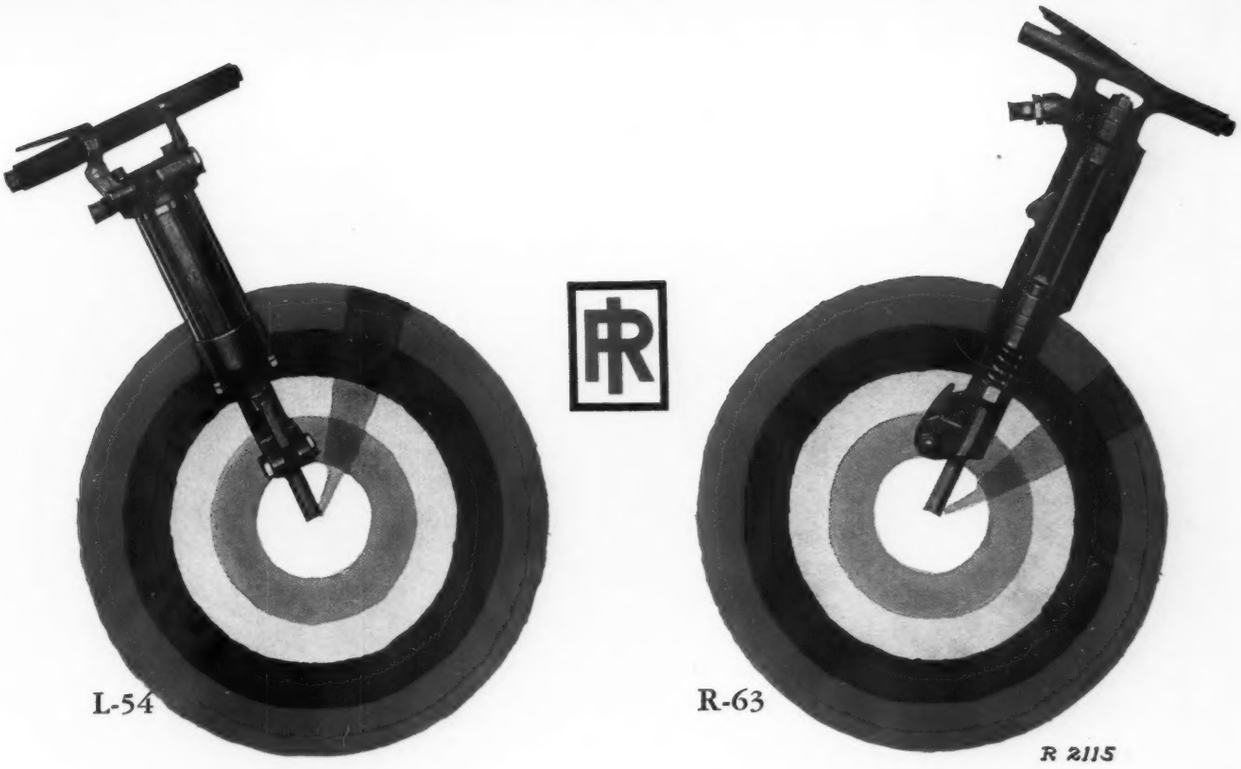
Plainfield, N. J.



FURNISHED IN STANDARD PIPE SIZES

WRITE FOR DESCRIPTION AND PRICES

NEW JERSEY METER CO.



Two New Paving Breakers Score 100% in the Contract Field

The new I-R Paving Breakers have caused a sensation in the contracting field. Though they were not placed on the market until July of this year, their acceptance by the trade has been phenomenal.

Wherever tried out, they have proved successful and have resulted in many repeat orders. Each machine has scored a bulls-eye.

The L-54 is a lightweight tool for demolition jobs, and is especially useful for horizontal work. It weighs 38 pounds.

The R-63 is particularly suitable for breaking up the hardest concrete, and is the easiest-holding Paving Breaker on the market. This tool weighs 80 pounds. Ask for Catalogue No. 4264.

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Ingersoll-Rand

PRINTED IN U.S.A.

COMPRESSED AIR MAGAZINE

—Founded 1896—

Business and Editorial Offices:
Bowling Green Building, No. 11 Broadway, New York City
Publication Office: Phillipsburg, N. J.

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LINWOOD H. GEYER, *European Correspondent*, *147 Leadenhall Street, London, E. C. 4*

F. A. MCLEAN, *Canadian Correspondent*, *10 Phillips Square, Montreal, Canada*

Contents of This Issue

VOL. XXXV, No. 12, December, 1930

Articles

Advertisements

P&H

SHOVELS
CRANES
DRAGLINES

A Complete Line, ½ to 3½ Cu. Yds.
Gas—Diesel—Electric

HARNISCHFEGER CORPORATION
Established in 1884
4403 W. NATIONAL AVE., MILWAUKEE, WIS.
Offices and Agents in All Principal Cities

SAND-BLASTS

Whatever your needs in Sand-Blast Equipment Pangborn can fill that need ... From the smallest portable outfit, weighing less than seventy pounds, to the largest machine ever built.

Your best guarantee of Pangborn Superiority lies in this fact:

"Go where you will and you will find more Pangborn Equipment than any other kind."

Please write for Bulletins on Pangborn Sand-Blast and Dust Collecting Equipment.

QUALITY PC PRODUCT

PANGBORN

CORPORATION
HAGERSTOWN, MD.

Jenkins VALVES ARE ALWAYS MARKED WITH THE "DIAMOND" JENKINS

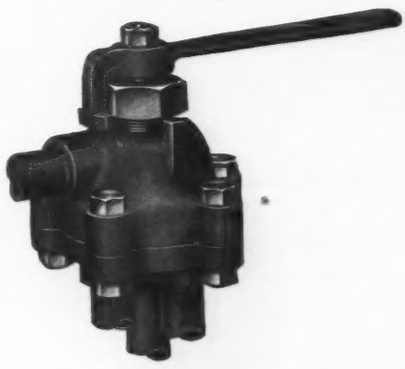
A squeeze starts the breeze

A Jenkins Air Gun fits your hand and fits your need. Squeeze the "easy curve" lever that fits in the palm, and you start a breeze under perfect control...for removing dust, dirt, chips, lint and filings thoroughly and quickly from the most hard-to-get-at places. A special Jenkins Renewable Disc for air service prevents leakage. The gun may be equipped with hose nipple, flat, rounded or extension tip. Obtainable at supply houses.

JENKINS BROS.
80 White St , New York, N. Y. 133 No. Seventh St., Phila., Pa.
524 Atlantic Ave., Boston, Mass. 646 Washington Blvd., Chicago, Ill.
1121 No. San Jacinto, Houston, Texas.
JENKINS BROS., Limited, Montreal, Canada, London, England.

Jenkins
VALVES
Since 1864

"Nicholson" Three and Fourway Valves

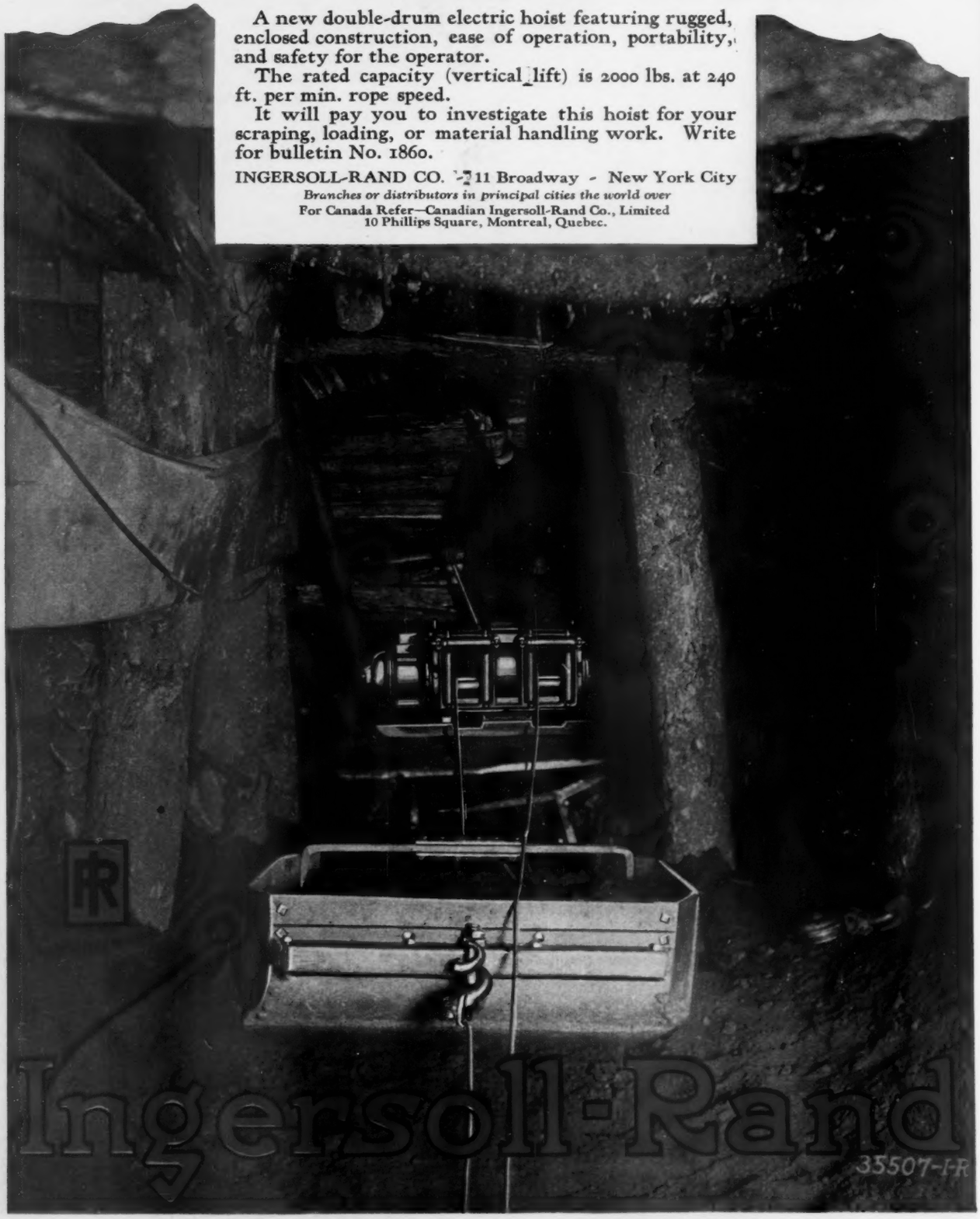


There is nothing more annoying and wasteful than a sticking, hard operating and leaking plug valve, when used for operating an air cylinder. The "Nicholson" Three & Fourway Valve is of the flat disc regrinding type, with the disc and seat made of non-corrosive metals that operate freely and do not leak. Applications include air hoists, car dumps, presses, molding machines, rubber machinery, die casting machines, etc. Made in all sizes from ¼" to 1½" inclusive. Write for Bulletin 1129.

W. H. Nicholson & Company
140 Oregon Street
Wilkesbarre, Pa., U. S. A.

Announcing!

The No. 215 Electric Slusher



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